

National Defense Industrial Association

Tank-Automotive Division

Combat Vehicles Section

1998

Combat Vehicles Conference

Proceedings

DISTRIBUTION STATEMENT A:
Approved for Public Release -
Distribution Unlimited

September 21-23, 1998

**US Army Armor Center
Fort Knox, Kentucky**

19981210 004

DTIC QUALITY INSPECTED 4

Event #860

TOTAL

OR FURTHER INFORMATION CONCERNING DISTRIBUTION CALL (703) 767-8040

Combat Vehicles Conference PLEASE CHECK THE APPROPRIATE BLOCK BELOW:

-AO #

☐ _____ copies are being forwarded. Indicate whether Statement A, B, C, D, E, F, or X applies.

**DISTRIBUTION STATEMENT A:**

APPROVED FOR PUBLIC RELEASE: DISTRIBUTION IS UNLIMITED

**DISTRIBUTION STATEMENT B:**

DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES ONLY; (Indicate Reason and Date). OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO (Indicate Controlling DoD Office).

**DISTRIBUTION STATEMENT C:**

DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS; (Indicate Reason and Date). OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO (Indicate Controlling DoD Office).

**DISTRIBUTION STATEMENT D:**

DISTRIBUTION AUTHORIZED TO DoD AND U.S. DoD CONTRACTORS ONLY; (Indicate Reason and Date). OTHER REQUESTS SHALL BE REFERRED TO (Indicate Controlling DoD Office).

**DISTRIBUTION STATEMENT E:**

DISTRIBUTION AUTHORIZED TO DoD COMPONENTS ONLY; (Indicate Reason and Date). OTHER REQUESTS SHALL BE REFERRED TO (Indicate Controlling DoD Office).

**DISTRIBUTION STATEMENT F:**

FURTHER DISSEMINATION ONLY AS DIRECTED BY (Indicate Controlling DoD Office and Date) or HIGHER DoD AUTHORITY.

**DISTRIBUTION STATEMENT X:**

DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND PRIVATE INDIVIDUALS OR ENTERPRISES ELIGIBLE TO OBTAIN EXPORT-CONTROLLED TECHNICAL DATA IN ACCORDANCE WITH DoD DIRECTIVE 5230.25, WITHHOLDING OF UNCLASSIFIED TECHNICAL DATA FROM PUBLIC DISCLOSURE, 6 Nov 1984 (Indicate date of determination). CONTROLLING DoD OFFICE IS (Indicate Controlling DoD Office).



This document was previously forwarded to DTIC on _____ (date) and the AD number is _____.



In accordance with provisions of DoD instructions, the document requested is not supplied because:



It will be published at a later date. (Enter approximate date, if known).



Other. (Give Reason)

DoD Directive 5230.24, "Distribution Statements on Technical Documents," 18 Mar 87, contains seven distribution statements, as described briefly above. Technical Documents must be assigned distribution statements.

Joseph P. Hyman

Print or Type Name

NDIA FID
1 Oct 98

703 247-2583

70:00 0651-60-1411

20/02/02

TABLE OF CONTENTS

Cover

Tuesday, September 22, 1998

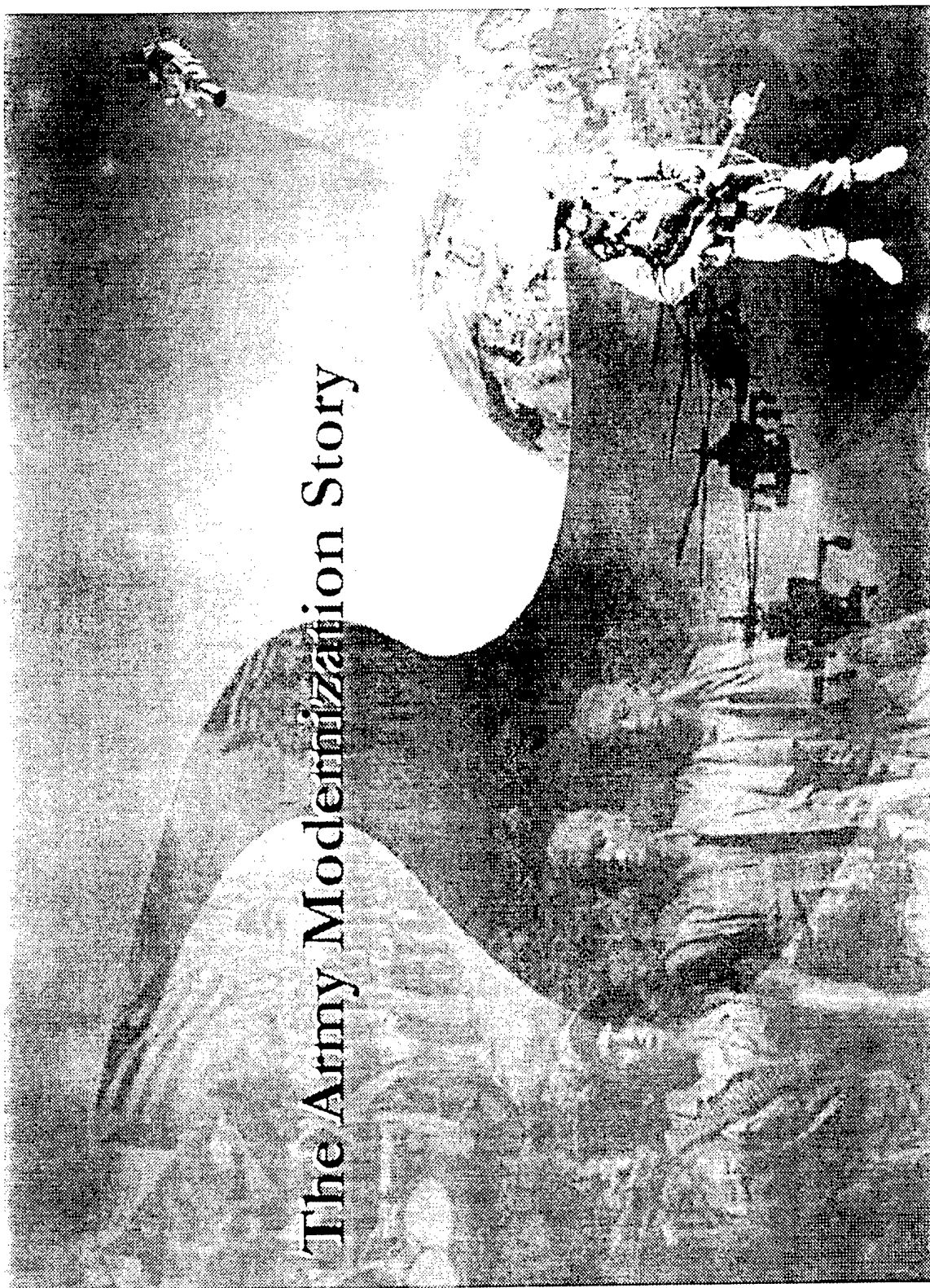
| | |
|---|-----|
| "The Army's 1998 Modernization Plan," by MG Peter C. Franklin, Deputy for Systems Management and Horizontal Technology Integration, Office of the Assistant Secretary of the Army for Research, Development and Acquisition and BG (P) Joseph M Cusumano, Jr., FD, ODCSOPS..... | 1 |
| "TACOM's Role in Meeting the Light/Strike Force Challenge," by MG Roy E. Beauchamp, Commanding General, U.S. Army Tank-automotive and Armaments Command (TACOM)..... | 28 |
| "Sustaining the Combat Vehicle Industrial Base" Panel: | |
| · Mr. Thomas W. Rabaut, President & CEO, United Defense L.P. | 63 |
| · Mr. Charles M. Hall, Vice President, Production and Delivery, General Dynamics Land Systems..... | 68 |
| "Future Scout Cavalry System (FSCS) Out of the Gate," by Mr. Roland Asokolis, U.S. Army Program Director for FSCS, TARDEC and Col. Peter Wall, Project Manager, TRACER, United Kingdom..... | 80 |
| "LAV Update," by Col. Thomas Lytle, Program Manager, LAV, USMC..... | 109 |
| "AAAV Update," by Col. Blake Robertson, Direct Reporting Program Manager, Advanced Amphibious Assault, USMC..... | 128 |

Wednesday, September 23, 1998

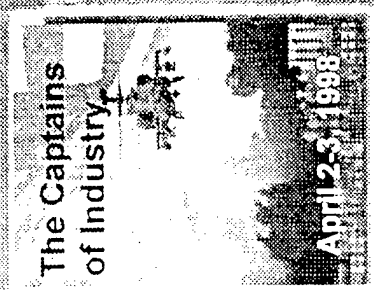
| | |
|--|-----|
| "PEO Ground Combat and Support Systems Execution Plan" Mounted Force Modernization Panel: | |
| · COL Paul S. Izzo, Program Manager, Bradley Fighting Vehicle..... | 145 |
| · COL Kenneth R. Dobeck, Program Manager, Medium Tactical Vehicles..... | 151 |
| · LTC Timothy J. Prendergast, Military Deputy, Joint Lightweight 155mm Howitzer..... | 161 |

| | |
|--|-----|
| · Mr. Joseph A. Gormley, Business Manager, Office of the Project Manager, Sense and Destroy Armor..... | 173 |
| · COL Raymond Pawlicki, Program Manager, Tank Main Armament Systems..... | 190 |
| · Mr. Kevin M. Fahey, Deputy Program Manager, Crusader..... | 199 |
| "TACOM Deputy for Acquisition Modernization Perspective Presentation," by COL (P) John M. Urias, Deputy for Systems Acquisition, TACOM. | 207 |
| "M113 FOV Overview," by LTC R. David Ogg, Program Manager, M113..... | 217 |
| "HMMWV Life Cycle MGT Strategy," by Ms. Nancy A. Moulton, Program Light Tactical Vehicles..... | 236 |

The Army Modernization Story



Objective

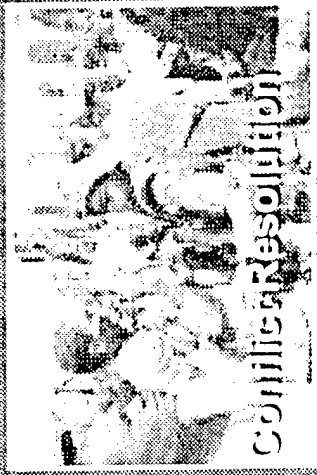


Tell the Army Acquisition
Community Modernization Story
Through a Business and
Army Executive Sess
ion with Army Leaders.

Tell the Army Modernization and
Investment Strategies to
Business and Industry Through
Outreach Seminars.



Why An Army ...



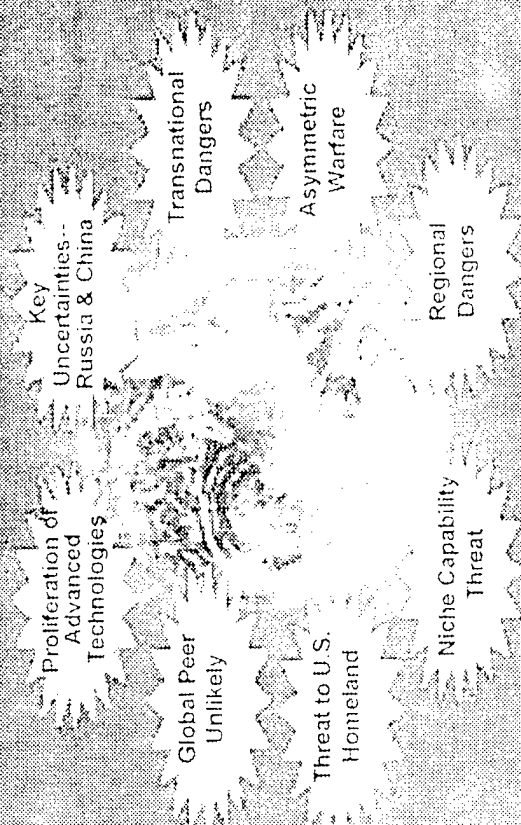
Winning Wars



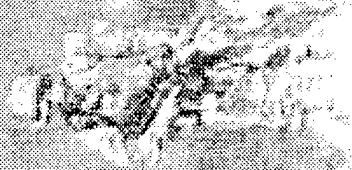
... to Meet the Nation's Needs Yesterday, Today and Tomorrow.

Geostrategic Environment Out to 2020

- Numerous Threats; Less Predictable
- Increased Potential for Asymmetric Threats
- Worldwide Influence Important to National Interests
- Opportunity and Responsibility to Meet Challenges of the Next Century



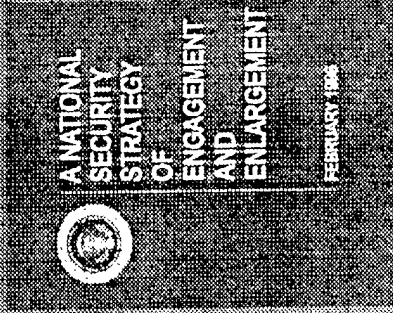
Prepare for the Way the World Is Likely to Be,
Notas We Would Like It to Be.



The U.S. National Security Strategy Goals Have Changed...

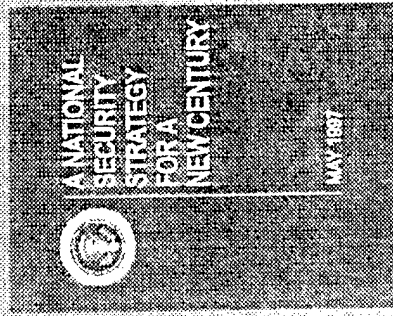
1996

- Enhance Security by Maintaining a Strong Defense
- Bolster Prosperity by Working to Open Foreign Markets and Spur Economic Growth
- Promote Democracy



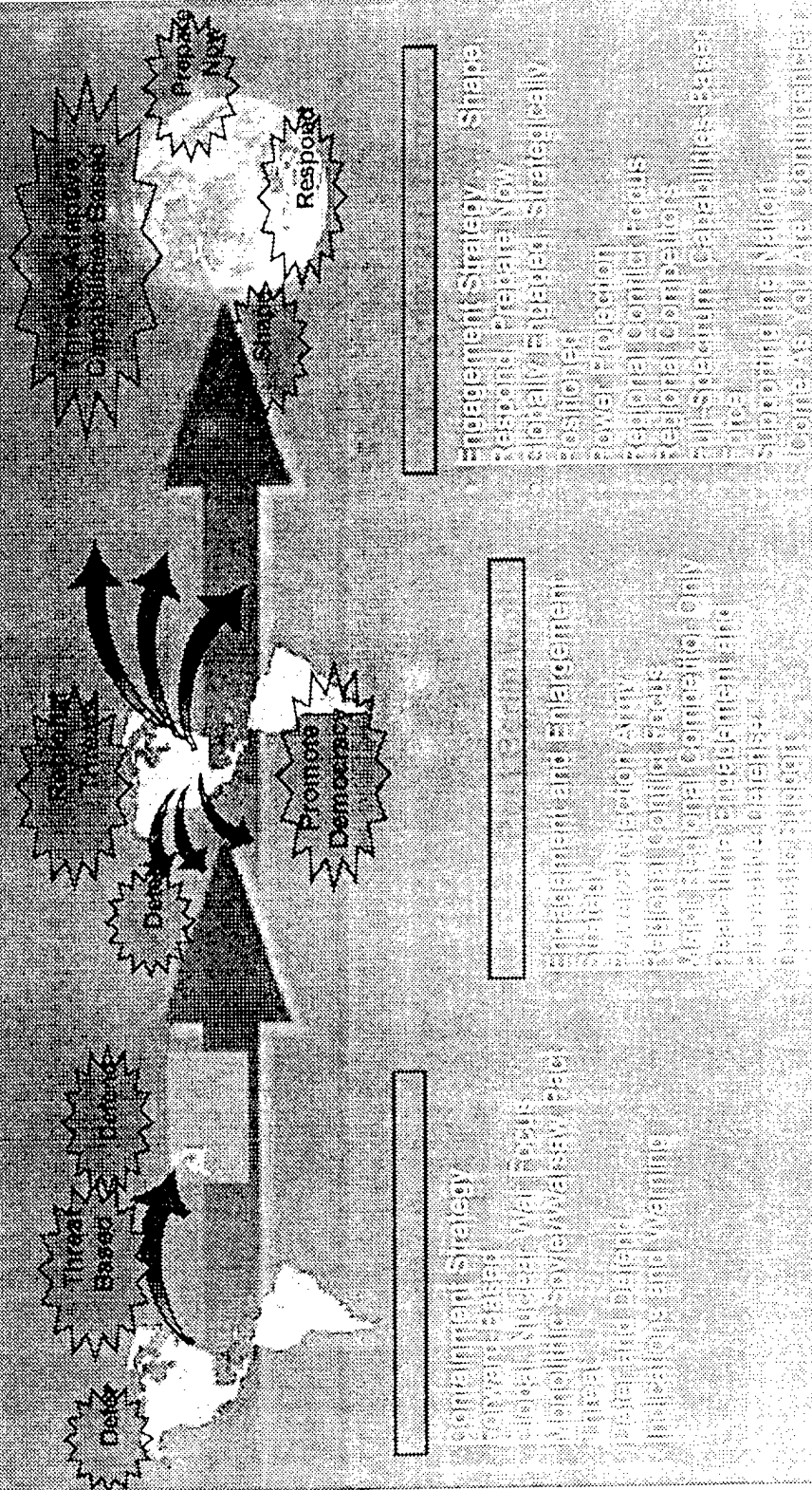
1997

- Preserve the Protection of Our Nation's Fundamental and Enduring Needs
- Enhance the U.S. and Secure our Interests
- Maintain the Sovereignty and the United States' Values
- Promote the U.S. and Secure our Interests
- Promote the U.S. and Secure our Interests



...To Prepare a Plan for an Uncertain Future.

Defense Requirements Have Changed . . .



10
9
8
7
6
5
4
3
2
1

[illegible]

| | |
|-----|-----|
| 100 | 100 |
| 90 | 90 |
| 80 | 80 |
| 70 | 70 |
| 60 | 60 |
| 50 | 50 |
| 40 | 40 |
| 30 | 30 |
| 20 | 20 |
| 10 | 10 |
| 0 | 0 |
| 100 | 100 |
| 90 | 90 |
| 80 | 80 |
| 70 | 70 |
| 60 | 60 |
| 50 | 50 |
| 40 | 40 |
| 30 | 30 |
| 20 | 20 |
| 10 | 10 |
| 0 | 0 |
| 100 | 100 |
| 90 | 90 |
| 80 | 80 |
| 70 | 70 |
| 60 | 60 |
| 50 | 50 |
| 40 | 40 |
| 30 | 30 |
| 20 | 20 |
| 10 | 10 |
| 0 | 0 |
| 100 | 100 |
| 90 | 90 |
| 80 | 80 |
| 70 | 70 |
| 60 | 60 |
| 50 | 50 |
| 40 | 40 |
| 30 | 30 |
| 20 | 20 |
| 10 | 10 |
| 0 | 0 |
| 100 | 100 |
| 90 | 90 |
| 80 | 80 |
| 70 | 70 |
| 60 | 60 |
| 50 | 50 |
| 40 | 40 |
| 30 | 30 |
| 20 | 20 |
| 10 | 10 |
| 0 | 0 |
| 100 | 100 |
| 90 | 90 |
| 80 | 80 |
| 70 | 70 |
| 60 | 60 |
| 50 | 50 |
| 40 | 40 |
| 30 | 30 |
| 20 | 20 |
| 10 | 10 |
| 0 | 0 |
| 100 | 100 |
| 90 | 90 |
| 80 | 80 |
| 70 | 70 |
| 60 | 60 |
| 50 | 50 |
| 40 | 40 |
| 30 | 30 |
| 20 | 20 |
| 10 | 10 |
| 0 | 0 |
| 100 | 100 |
| 90 | 90 |
| 80 | 80 |
| 70 | 70 |
| 60 | 60 |
| 50 | 50 |
| 40 | 40 |
| 30 | 30 |
| 20 | 20 |
| 10 | 10 |
| 0 | 0 |
| 100 | 100 |
| 90 | 90 |
| 80 | 80 |
| 70 | 70 |
| 60 | 60 |
| 50 | 50 |
| 40 | 40 |
| 30 | 30 |
| 20 | 20 |
| 10 | 10 |
| 0 | 0 |
| 100 | 100 |
| 90 | 90 |
| 80 | 80 |
| 70 | 70 |
| 60 | 60 |
| 50 | 50 |
| 40 | 40 |
| 30 | 30 |
| 20 | 20 |
| 10 | 10 |
| 0 | 0 |
| 100 | 100 |
| 90 | 90 |
| 80 | 80 |
| 70 | 70 |
| 60 | 60 |
| 50 | 50 |
| 40 | 40 |
| 30 | 30 |
| 20 | 20 |
| 10 | 10 |
| 0 | 0 |
| 100 | 100 |
| 90 | 90 |
| 80 | 80 |
| 70 | 70 |
| 60 | 60 |
| 50 | 50 |
| 40 | 40 |
| 30 | 30 |
| 20 | 20 |
| 10 | 10 |
| 0 | 0 |
| 100 | 100 |
| 90 | 90 |
| 80 | 80 |
| 70 | 70 |
| 60 | 60 |
| 50 | 50 |
| 40 | 40 |
| 30 | 30 |
| 20 | 20 |
| 10 | 10 |
| 0 | 0 |
| 100 | 100 |
| 90 | 90 |
| 80 | 80 |
| 70 | 70 |
| 60 | 60 |
| 50 | 50 |
| 40 | 40 |
| 30 | 30 |
| 20 | 20 |
| 10 | 10 |
| 0 | 0 |
| 100 | 100 |
| 90 | 90 |
| 80 | 80 |
| 70 | 70 |
| 60 | 60 |
| 50 | 50 |
| 40 | 40 |
| 30 | 30 |
| 20 | 20 |
| 10 | 10 |
| 0 | 0 |
| 100 | 100 |
| 90 | 90 |
| 80 | 80 |
| 70 | 70 |
| 60 | 60 |
| 50 | 50 |
| 40 | 40 |
| 30 | 30 |
| 20 | 20 |
| 10 | 10 |
| 0 | 0 |
| 100 | 100 |
| 90 | 90 |

[illegible][illegible][illegible]

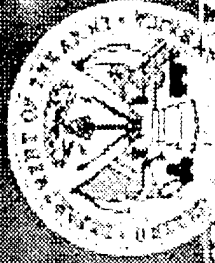
Figure 6. The effect of the number of iterations (n) on the accuracy of the proposed algorithm. The results are shown for different values of α and β . The x-axis represents the number of iterations (n), ranging from 0 to 100. The y-axis represents the error, ranging from 0 to 1.0. The legend indicates different values of α and β : $\alpha=0.5, \beta=0.5$ (solid line); $\alpha=0.5, \beta=0.7$ (dashed line); $\alpha=0.5, \beta=0.9$ (dotted line); $\alpha=0.7, \beta=0.5$ (dash-dot line); $\alpha=0.7, \beta=0.7$ (long-dash line); $\alpha=0.7, \beta=0.9$ (short-dash line).

From "Threat-Based Force to HillsSpecimen,"
"Threats Adaptive, Capabilities-Based Force."

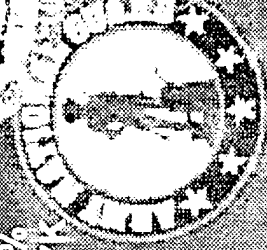
The Army Has Changed...

Since the Fall of the Berlin Wall

46%
495K



34%
367K



20%
208K



• Diminished Resources:

- Total Army Personnel Reduced by 245,000
- Budget Decreased 39%
- Materiel Base Down 35%
- 700 Installations Closed Worldwide

• Increased Integration of Active and Reserve Components

• Expanded Missions

- 22,833 Soldiers Deployed to 42 Countries
- 23 Operational Deployments

...To Adapt to the New World Order

As the Nation's Force of Choice...



73% — Panama
Operation Just Cause



57% —
Operation Desert Storm



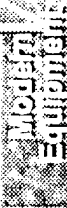
96% — Haiti
Operation Uphold Democracy



Training



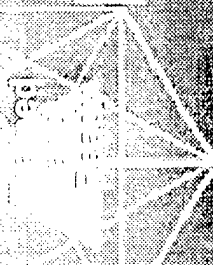
87% — Bosnia
Operation Joint Endeavor



Modern
Equipment



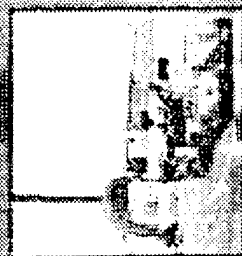
Force Mix



Doctrine



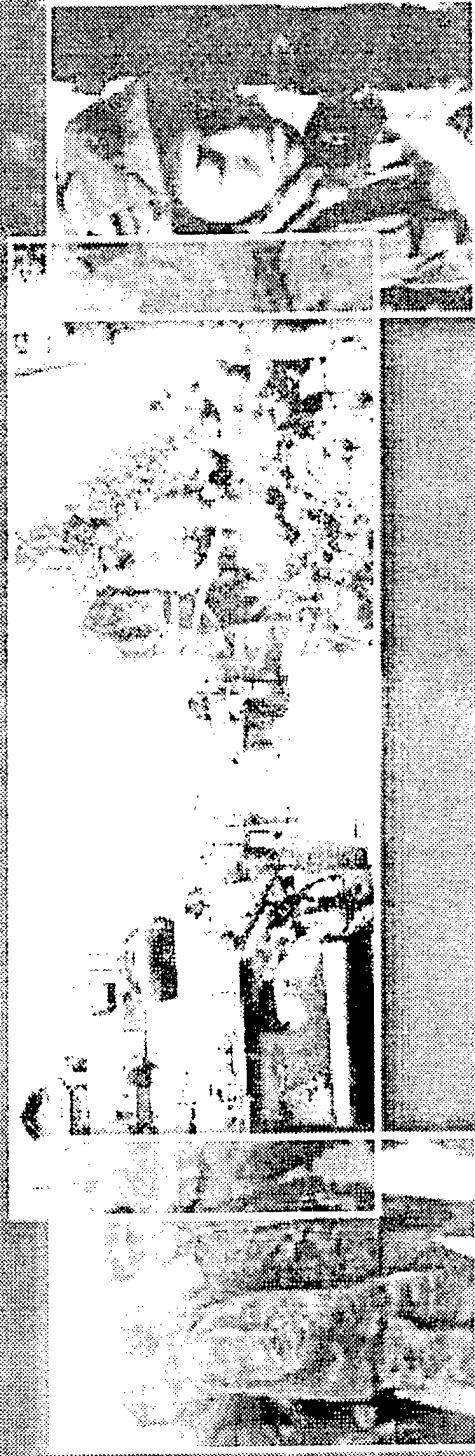
79% — Kuwait
Operation Southern Watch



87% — Kuwait
Operation Vigilant Warrior

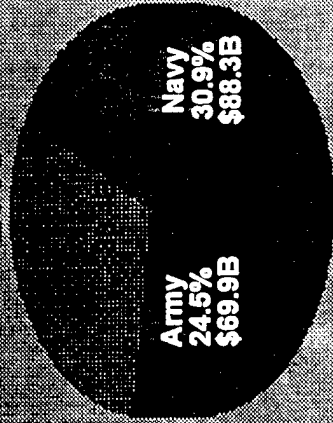
...The Army Provides the "Boots on the Ground."

The Bottom Line . . .



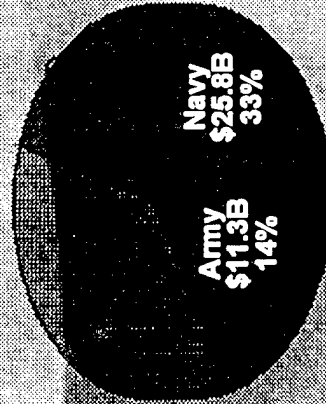
The Funding Paradigm . . .

2003



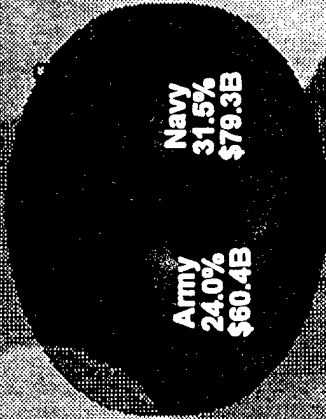
DoD TOA
\$88.3B

1998



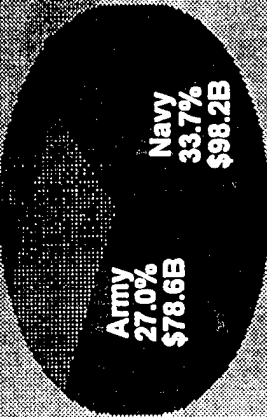
RDA TOA = \$78.5B

1998



DoD TOA = \$252.2B

1989



DoD TOA
\$98.2B

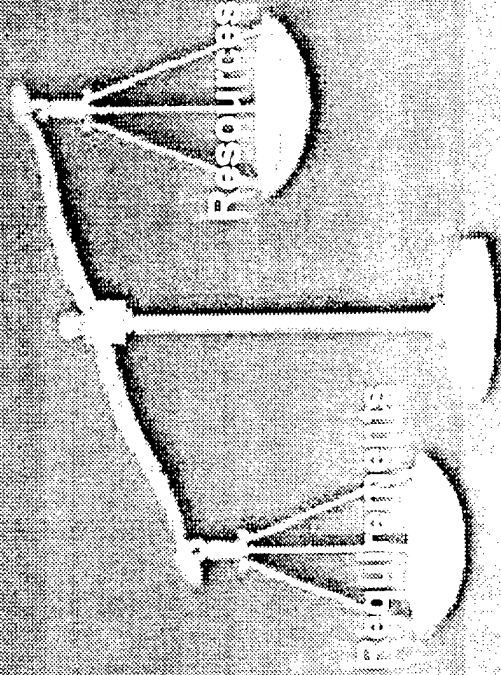
Army RDA Budget
Dropped 54% Since
Constant FY98 \$

... Has Not Changed

The Army's Dilemma . . .

Conduct Full
Spectrum
Operations

Achieve Swift
Victory With
Minimum
Casualties



National Military Strategy

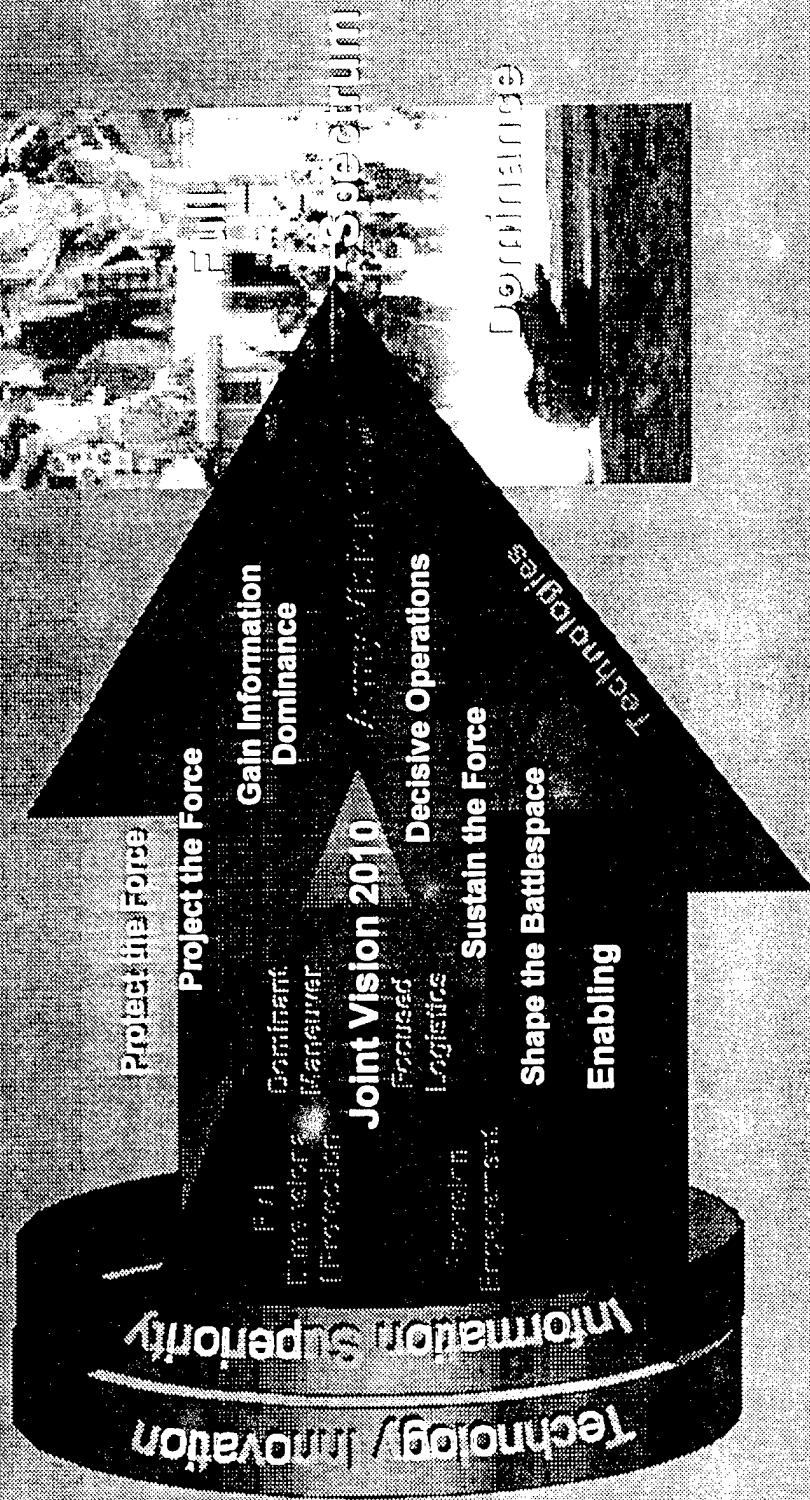
Shape

Respond

Prepare for

. . . The Strategic Imbalance -- Requirements and Resources.

Army Vision 2010...



...the blueprint for decisive victory in the 21st century.

Spiral Development . . .

Revolutionary
Path

Force XXI

Experimentation

Protect the Force
Project the Force
Information
Dominance
Decisive Operations
Sustain the Force
Shape the
Battlepace

Focused
Research &
Development

Full
Spectrum
Dominance

After
Action

Enhanced
Overmatch
Systems
Abrams
Apache
Bradley
Paladin

Evolutionary
Path

Overmatch Systems

Abrams
Apache
Bradley
Paladin

Digitization

Maintain Combat Overmatch

The Modernization and Investment Strategies . . .

Strategy

- Prioritize and Synchronize Investments Over Time

Goals

- Digitize the Army
- Maintain Combat Overmatch
- Sustain Essential R&D and Focus S&T to Leap-Ahead Technologies for AAN
- Recapitalize 100% of the Fleet
- Integrate the AG and the RC

Investments

- Information Dominance in the Near- and Mid-Terms
- New Weapons Systems and Capabilities that Enable a Revolution in Military Affairs in the Long-Term

Army After
Next

... Provide a Road Map for the Army to Achieve Full Spectrum
Dominance for Army XXI and Positions itself for Army After Next.

Information Dominance . . .

Where Am I?



- Global Positioning System
- Army Battle Command System

Where Are My Friends?



- Situational Awareness
- Combat ID
- Onboard Sensor Processing
- Future Digital Radio
- Power Projection

Where Is the Enemy?

- Onboard Sensor Processing
- Future Digital Radio
- Power Projection
- Onboard Sensor Processing
- Future Digital Radio
- Power Projection



Concept:

Provide the Commanders and Soldiers an
Uninterrupted Flow of Information for
Increased Situational Awareness to More
Readily Seize and Retain the Initiative.

. . . Gives Commanders the Decisive Edge.

Combat Overmatch . . .

- Tailor Incremental Improvements to Retain Overmatch Against Potential Adversaries
- Continue to Evolve Force Structure Changes and Redesign
- Enhance Weapons Systems Capabilities

Retain Superior Combat Capabilities
Over Any Opponent by Virtue of
Combat Systems Which Employ
Advanced Technologies

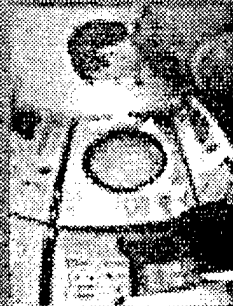
Crusader



Javelin



Patriot PAC-3



... To Secure Swift Victory With Minimal Casualties.

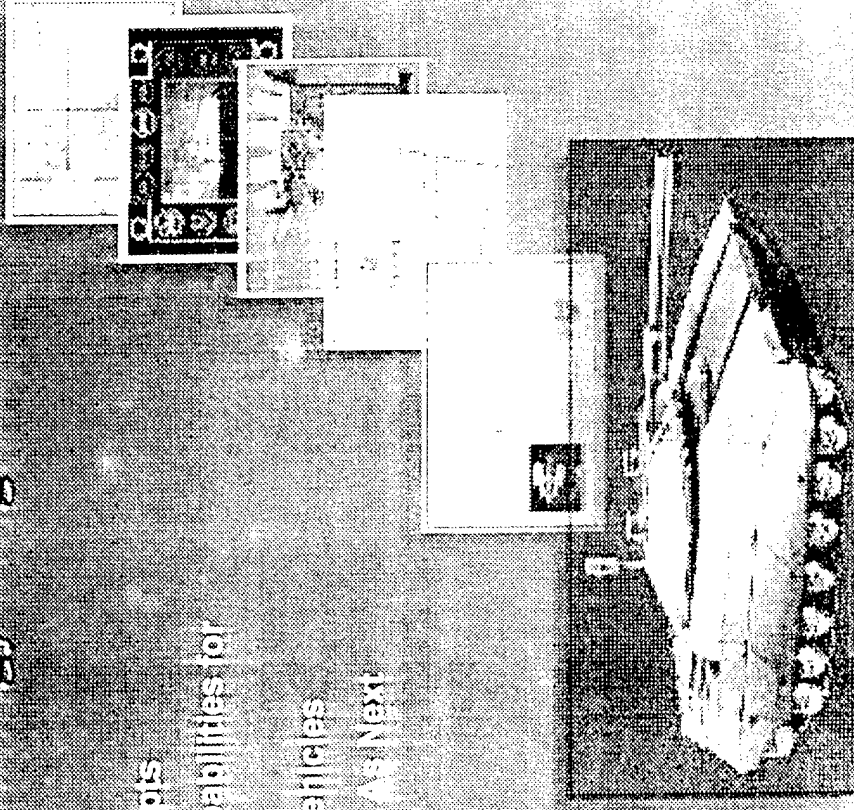
Science and Technology Programs . . .

Speed and Knowledge

- Support Emerging Army After Next Concepts
- Bridge Fielding Gap With Leap-Ahead Capabilities for Army Vision 2010
- Lighter, More Mobile, More Supportable Vehicles
- Provide Continued Improvements As Well As Next Generation Capabilities

Concept:

Funding and Focusing Science and Technology and the Industrial Base to Provide Leap-Ahead Systems to Support the Future Army



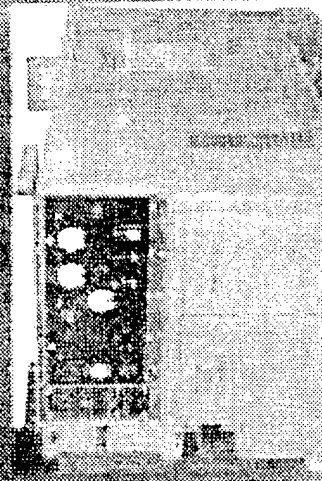
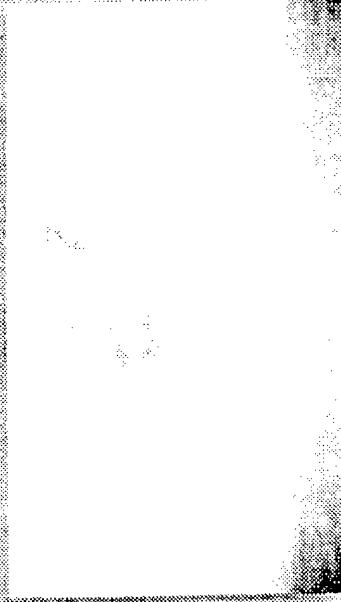
Future Combat System

... Provide a Significant, Revolutionary Improvement Over Current Capabilities.

Equipment Recapitalization . . .

- Replacement
- Extended Service Programs (ESP)
- Planned Product Improvements
- Service Life Extension Program (SLEP)
- Partial Rebuild
- Technology Upgrade/Horizontal Integration

Chinook



Generator

Concept

Replace or Retrofit Existing Systems to Guard Against the Effects of Mechanical Aging, Technical Obsolescence, or Excessive Expense to Maintain

Seeks to Guard Against Obsolescence and the High Costs of Aging.

Contributing Capabilities...

- Non-TOE Equipment
- Safety
- Logistics
- Environmental Compliance
- Facilities



Logistics



Facilities

Concept

Capabilities and Infrastructure
Necessary to Conduct
Fundamental Operations.

... Are Essential to Properly Field, Equip, Sustain,
and Train the Force.

Investment Strategy . . .

Components

Information Dominance

Combat Overmatch

Science and Technology

Recapitalization

Contributing Capabilities

FY98-03

- Achieve Proven Innovations

FY04-10

- Bridge to the Next Century

FY11-20

- A True Revolution in Military Affairs

Army After Next

Components Remain Flexible Enough to Accommodate Change.

Near-Term . . . Fiscal Years 1998 to 2003

- | | |
|---|--|
| Warfighting Programs <ul style="list-style-type: none"> • Army Battle Command Systems • Warfighter Information Network--Terrestrial Transport • Command and Control Warfare--C2 Protect & C2 Attack • JSTARS Common Ground Station • Power Projection C4I | Information Enhanced Systems <ul style="list-style-type: none"> • Abrams • Bradley • Land Warrior • AH-64 Apache Longbow • Future Scout Cavalry System (Advanced Technology Demonstration) |
|---|--|

- | | |
|--|---|
| <ul style="list-style-type: none"> • 2nd Generation Forward Looking Infra-Red (FLIR) • AH-64 Apache Upgrade • Javelin | <ul style="list-style-type: none"> • PATRIOT Upgrade • M1A2 SEP • Sense and Destroy Armor (SADARM) |
|--|---|

- | | |
|--|---|
| <ul style="list-style-type: none"> • Battlefield Combat ID • Power Efficiencies (Batteries) • Low Cost Missile Guidance | <ul style="list-style-type: none"> • Titanium/Composite Components • Smart Barrel Actuation • Enhanced Lethality |
|--|---|

- | | |
|---|--|
| <ul style="list-style-type: none"> • Tactical Vehicle • Medium Truck SLEP | <ul style="list-style-type: none"> • Tactical Quiet Generators • Command and Control Vehicle (C2V) |
|---|--|

- | | |
|--|--|
| <ul style="list-style-type: none"> • Rail Cars • C-17s | <ul style="list-style-type: none"> • Roll-On/Roll-Off Ships • Logistics-Over-the-Shore Equipment |
|--|--|

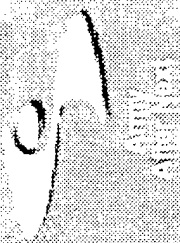
Information
Enhancement

Command
and Control

Power
Efficiencies

Low Cost
Missile Guidance

Power
Efficiencies



Mid-Term . . . Fiscal Years 2004 to 2010

- Joint Tactical Radio
- Comanche
- All Source Analysis System (ASAS) Block II
- Crusader
- High Mobility Artillery Rocket System (HIMARS)
- Follow-On to TOW (FOTT)
- Theater High-Altitude Area Defense (THAAD)
- Army Tactical Missile System (ATACMS) Brilliant Anti-Armor Submunition (BAT)
- Dynamic Obstacles
- Precision Systems
- Precision Munitions
- Lightweight Materials
- Active/Passive Efficiencies
- Tactical Internet/SINCGARS
- Target Acquisition Systems (Q36/37)
- Integrated System Control (ISYSCON)
- Stinger Block II
- UH-60 Blackhawk
- HEMTT II
- Total Asset Visibility (TAV)
- Material Handling Equipment

Far-Term . . . Fiscal Years 2011 to 2020

Information
Requirements

- All Source Analysis System (ASAS) P3I
- Firefinder P3I

Combat
Overwatch

- Future Direct Support Weapon
- Future Infantry Vehicle
- Future Combat System
- 3rd Generation FLIR
- Laser Decoy
- Active Protection

Support
Requirements

- Electric Propulsion
- Lightweight Materials
- Self-Sufficient Autonomous Battle Systems
- Brilliant Munitions

Logistics
Requirements

- Multiple Launch Rocket System
- CH-47D Chinook
- OH-58D Kiowa Warrior
- Palletized Loading System
- Bradley Linebacker
- PATRIOT

Medical
Requirements

- Armored Medical Treatment Vehicle
- Reverse Osmosis Water Purification Unit
- Deployable Medical Systems



Army
Navy

Industry-Army Team

New Weapons Systems and Equipment Must

- Be Cost Efficient and Relevant
- Be Lighter, Faster, More Lethal Multipurpose Weapons Platforms
- Provide Leap-Ahead Capability
- Maintain Baseline Interoperability for the Total Force
- Leverage Improvements to Provide True Overmatch



Army Initiatives

- Streamline Acquisition
- Partnerships
- Acquisition Reform
 - Tools
 - Streamline System
 - Reduce Process Costs
 - Reduce Cost to Supplier Base
 - Eliminate Barriers
 - Reduce Overhead
 - Streamline Processes
- Expedite Acquisition
- Shared Information



The Army Modernization Story

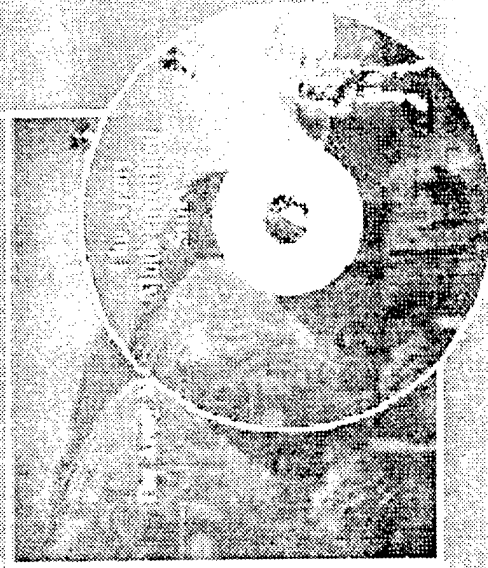
- Continuous Process of Change and Growth
- Fielding a Versatile Army to Meet Tomorrow's Challenges
- Preparing Now for the 21st Century



What's Next....

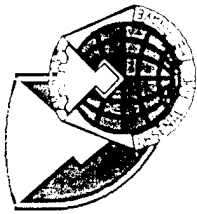
Contents

- The Army Modernization Story
- Joint Vision 2010
- Army Vision 2010
- 3MDS Vision 2010
- Army Modernization Strategy
- 1993 Weapon Systems Handbook



Objective

Continue to Strengthen
the Industry-Army Relationship

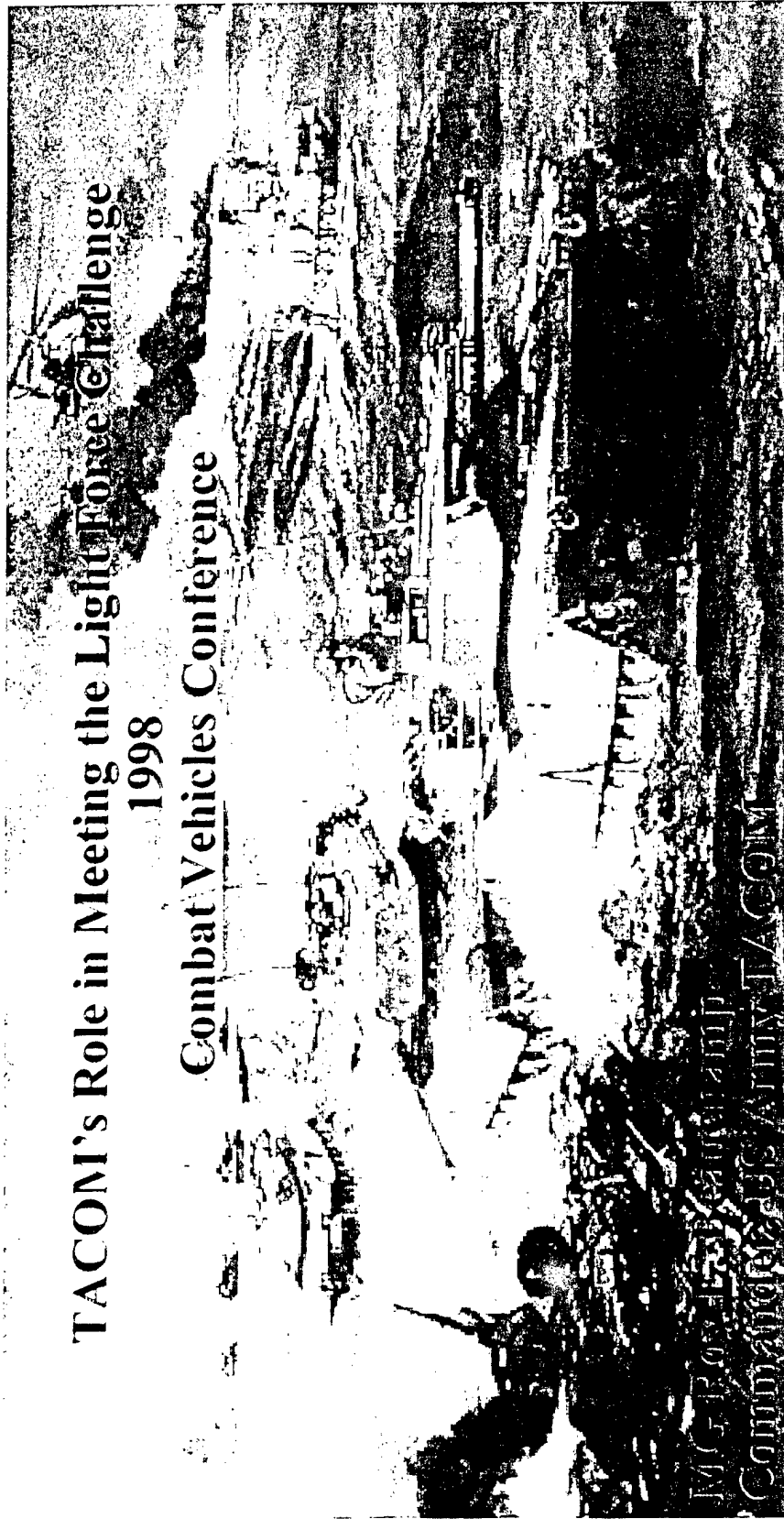


TACOM

*Mobility and Firepower
for America's Army*

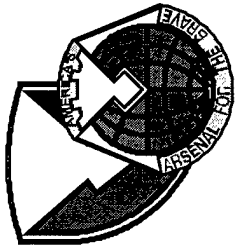


TACOM's Role in Meeting the Light Force Challenge 1998 Combat Vehicles Conference

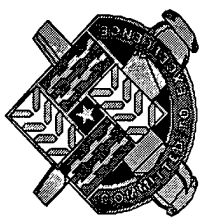


Major General William H. Gault
Commanding General, Army TACOM

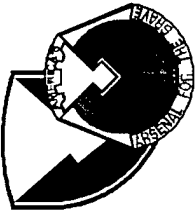
Committed to Excellence



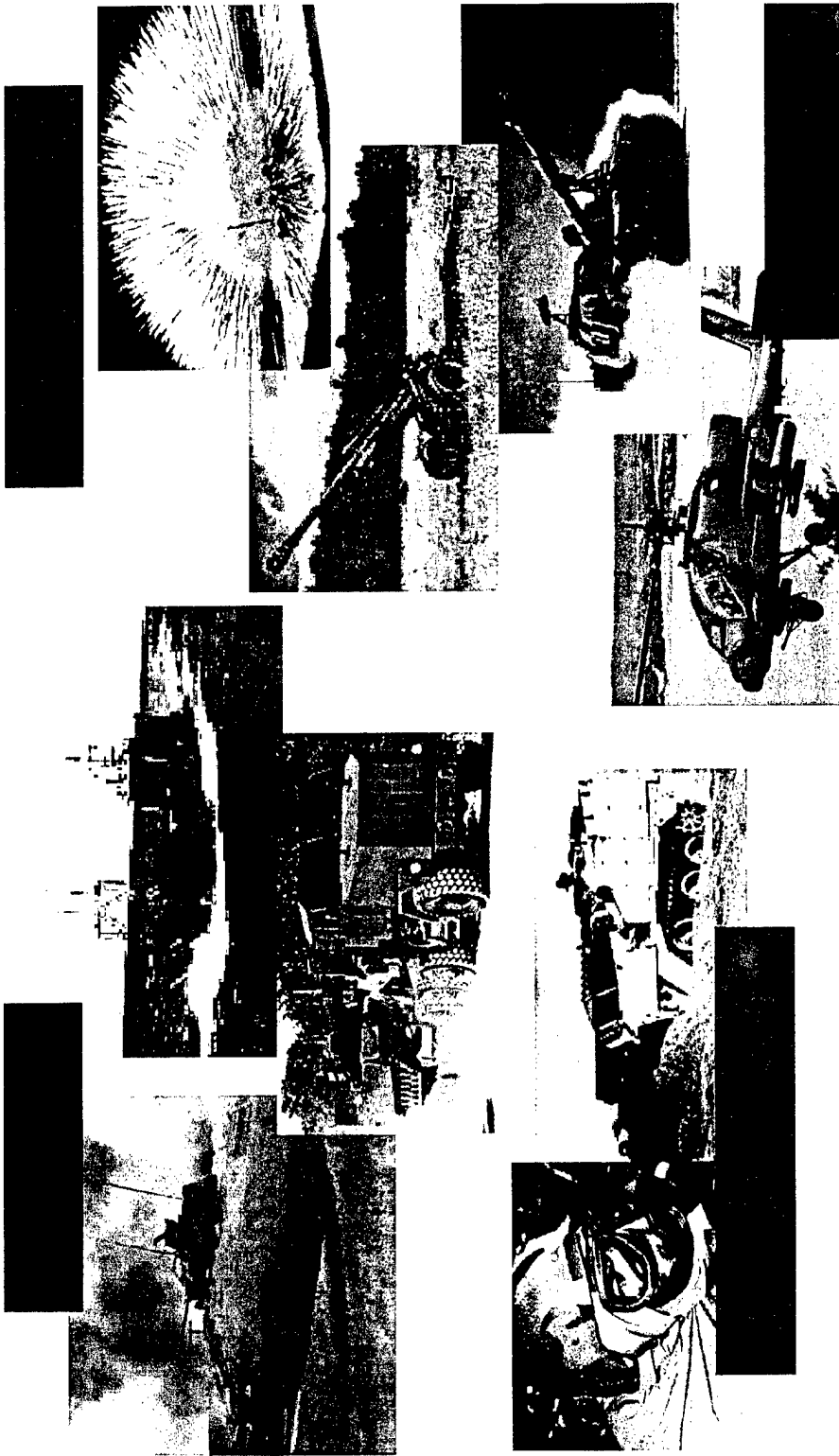
Agenda



- TACOM Overview
- Quick Look Back
- Changing Environment
- Support to Future Armored Systems
- TACOM Technology
- Summary

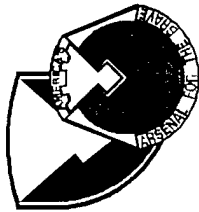


TACOM is ...

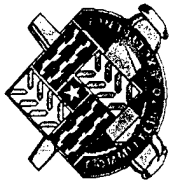


Committed to Excellence

9/22/98



What Is TACOM? ...A Public Corporation...



* Buys material used by Army, other DoD and FMS... 92,270 contractual actions in 97

KNOWS
THE
MARKET

- Stocks material ... \$4.276B*

- Supports Weapon System Readiness for 3,341 Systems (NSNs)
Receives & Fills Customer Orders ... \$1198.3M

Army \$850.9M NGB \$117.1M Marines \$57.7M
Foreign Customers/SSA \$142.6M Other \$30.0M

KNOWS
THE
INDUSTRY

Manages Stock Numbers in the DoD System
- 34,138 NSNs... consumable/reparable items
Performs Technical Support to (TDPs):
(In support of FY98 procurement actions)
- IMMC/ACALA 6000

KNOWS
THE
CUSTOMER

DLA Centers 1210
- Maintain Tech Data... 7.5M drawings
- Coordinates with services on engineering issues
- Insures technical conformance / quality assurance
Research and Development

KNOWS
THE
PRODUCT

- 80 Tech Base Programs
- 93 Engineering Development Programs
15 Project/Product Managers - Over 300 systems
- Combat Vehicles - Commercial items
- Tactical Systems

MARKETPLACE
LEVERAGE

As of Feb 98
* As of Sep 97

ATDS 5
STOs 29
ICTS 21
CRADAs 79

12.4 M Sq. Ft.
Facilities (\$2.4B)

33%
of TOTAL
AMC
SALES

964,000 NSNs
SUPPORTED
BY ENGR

ADVANCE USE
OF DUAL USE
TECHNOLOGIES

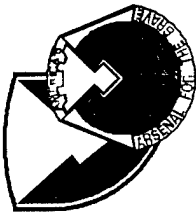
MANAGES 33%
OF THE
ARMY INVENTORY

LEGAL
ASSISTANCE

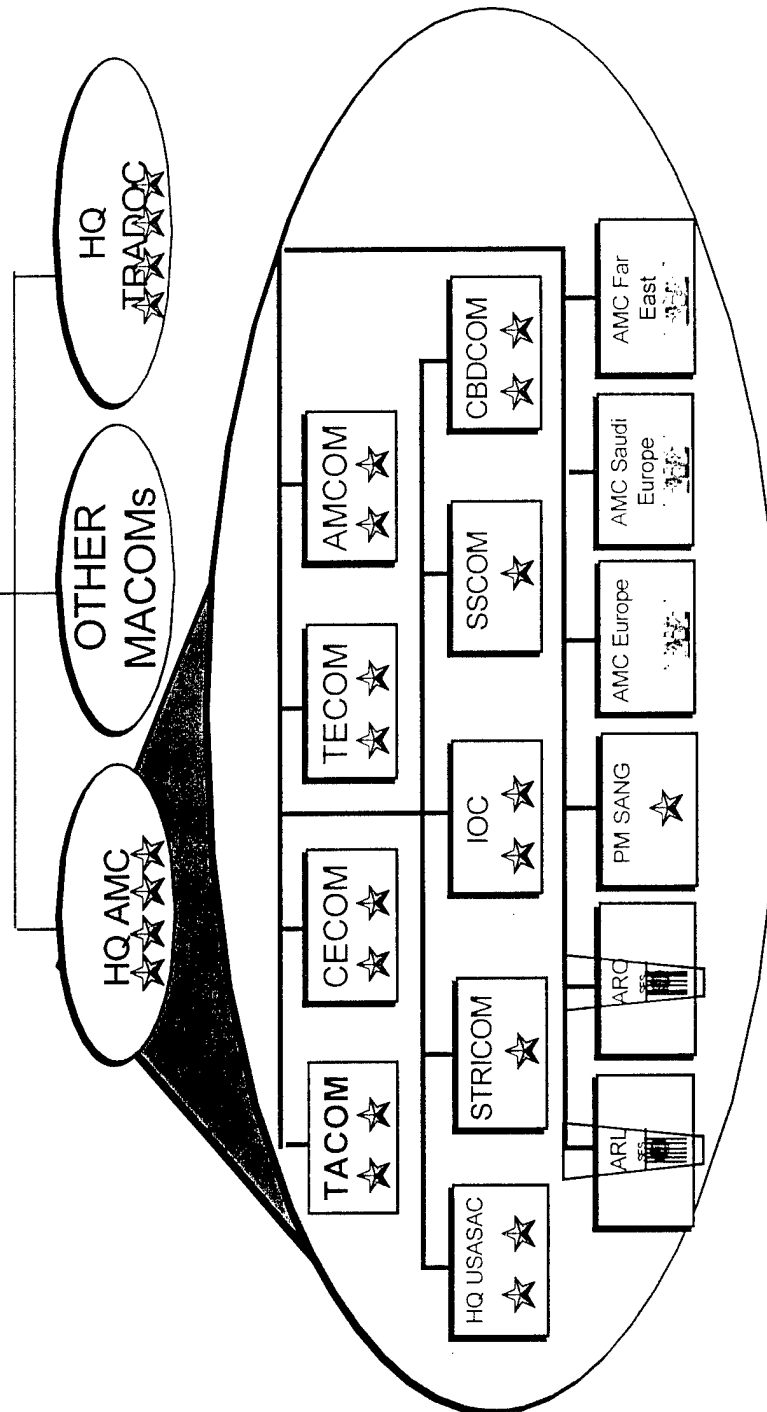
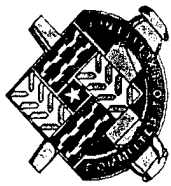
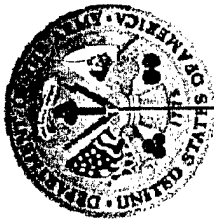
PRODUCT
CONFORMANCE

PRODUCT
INTEGRITY

GO TO WAR
PARTNERSHIP

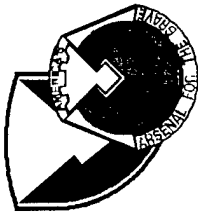


Department Of The Army



Committed to Excellence

9/22/98



History Of TACOM

... We Were There ...



In the beginning...

Middle Forge
Established

"Picatinny
Powder Depot"
Established

...when we were
needed...

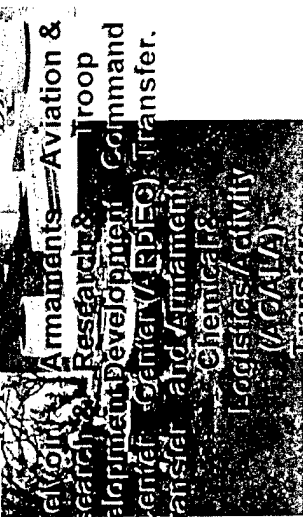
Picatinny
Becomes HQ
For The
Armament R&D
Command

...in the future...

ARDEC

WARREN

1749 — 1775 — 1880-03 — 1926 — 1967 — 1975-77 — 1991 — 1997



Rock Island
Arsenal
Begins
Construction

Develops And
Repairs Tanks

Becomes
Weapons
Command
(WECOM)

TEOSCOM
Transfer
Becomes
Armament
Command
(ARCOM)

Belmont's Armaments—Aviation & Research & Development Center (RDEC) Transfer. Center and Armament Chemicals/Logistics Activity (ACALA) Transfers

1862

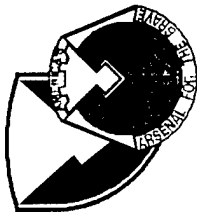
1919-1973

1962

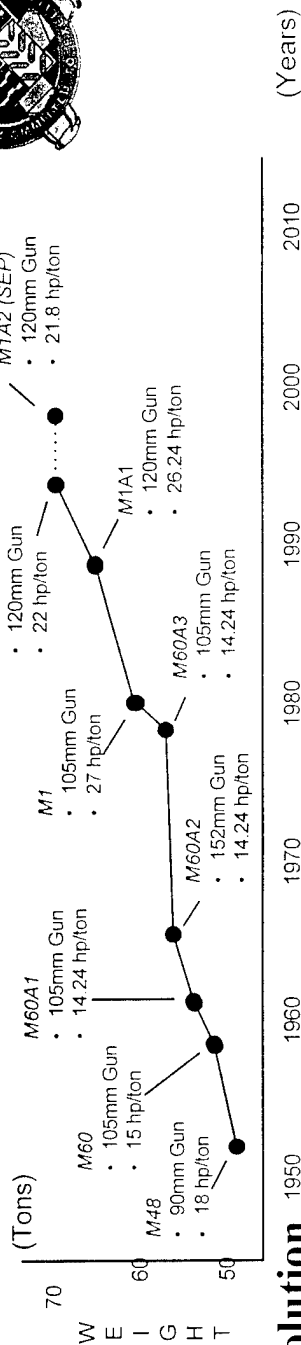
1973

9/22/98

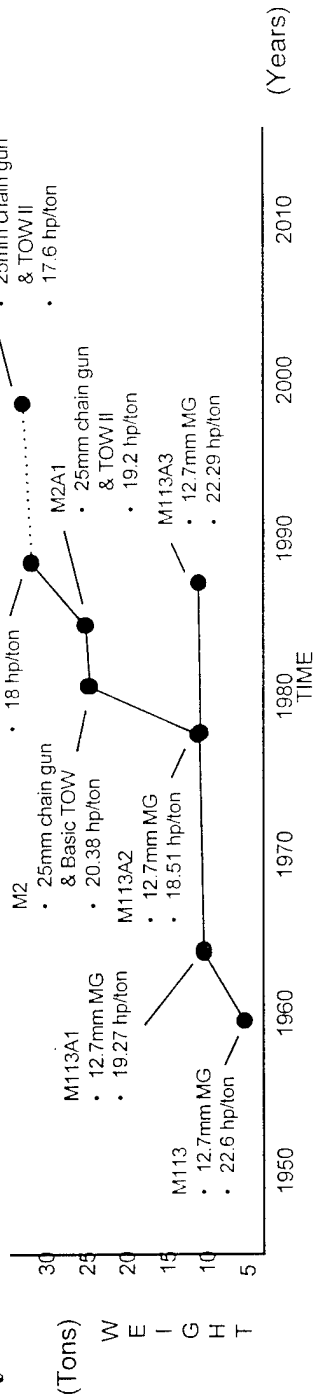
Committed to Excellence



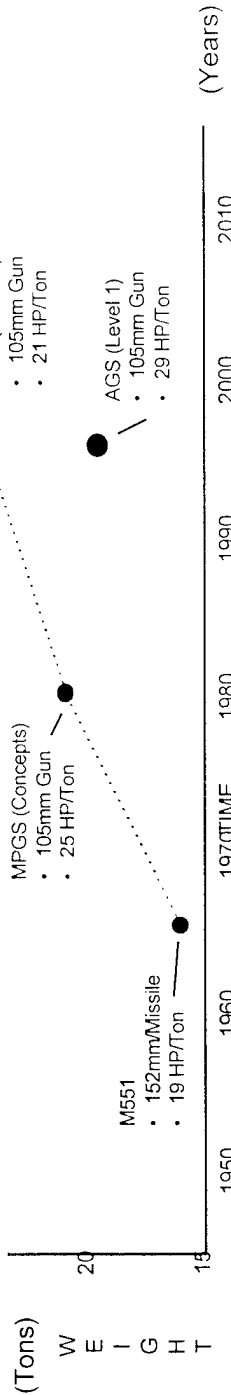
Vehicle Evolution



Infantry Vehicle Evolution

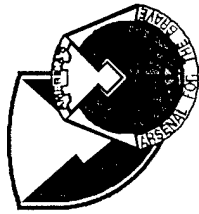


Light Armor Evolution

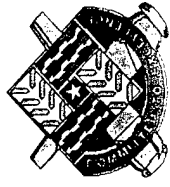


Committed to Excellence

9/22/98



The Strategic Environment Has Changed



Yesterday

Threat Based

Forward Deployed w/Fixed Pre-Po
Deter, Defend, Contain
Monolithic Soviet Threat
Indications & Warning
Global Nuclear War Focus



Threat Defined

Capabilities Based

Today & Tomorrow

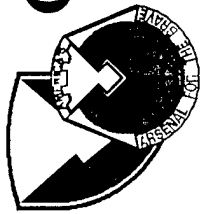
- Conus Based Power Projection w/ Pre-Po Afloat
- Prepare, Shape, Respond
- Asymmetric Full Spectrum Threats
- "Come as You Are" Contingencies
- Focus on Regional Threats, Major Regional Competitors



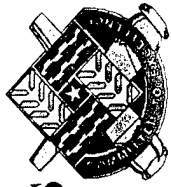
Threat Undefined

9/22/98

Committed to Excellence



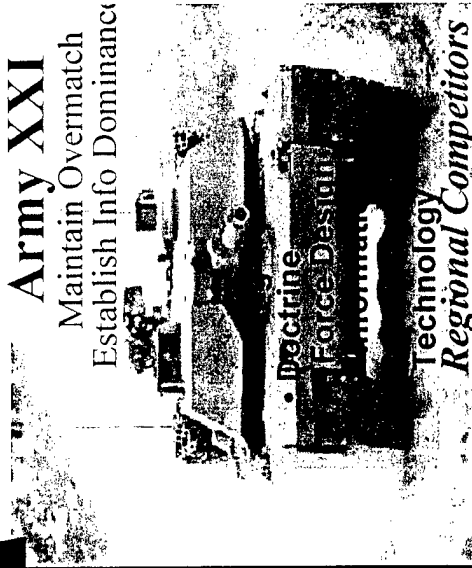
Changing To Meet The Nation's Needs Today & Tomorrow



*Fielding
Force XXI
while focusing
on the
Army After Next*

C A P A B I L I T Y

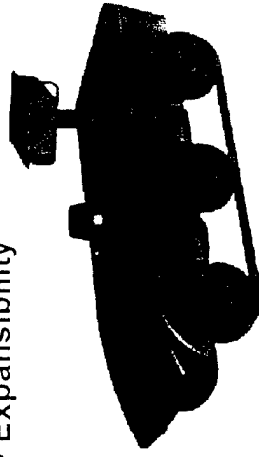
Army XXI
Maintain Overmatch
Establish Info Dominance



Army After Next
Knowledge & Speed
Full-Spectrum Dominance

Revolutionary Change...

- Greater Lethality
- Greater Strategic / Operational Mobility
- Logistically Unencumbered
- Greater Versatility
- Narrow gap between Heavy / Light Capability
- Lethal / Non-lethal
- Expansibility



to Major Competitors

1997

2010

TIME

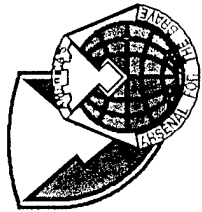
2020

2025

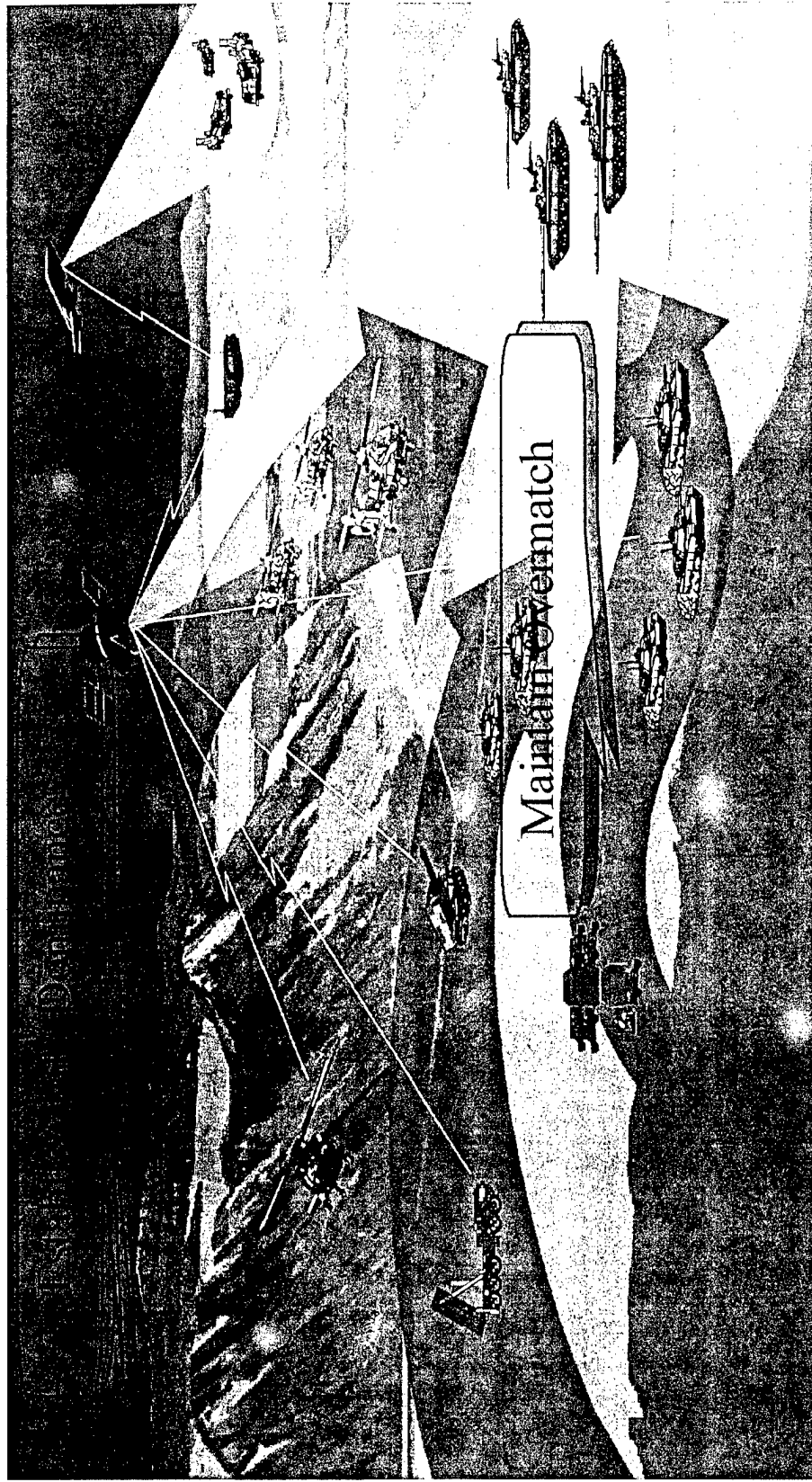
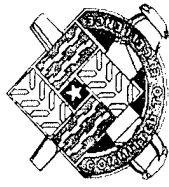
To achieve continuous full-spectrum dominance

9/22/98

Committed to Excellence

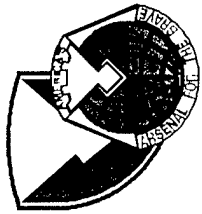


Army XXI

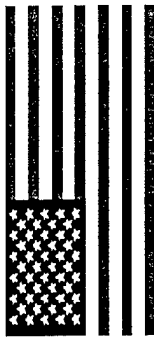
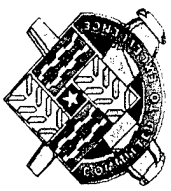


9.22.98

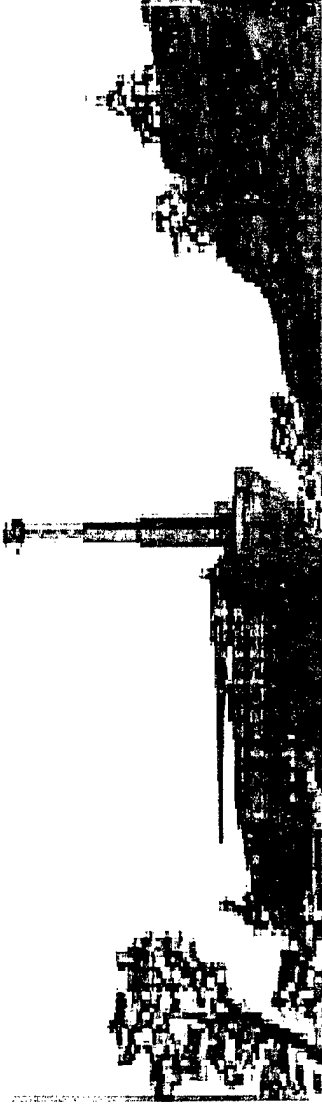
Committed to Excellence



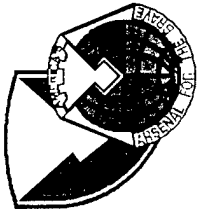
Future Scout And Cavalry System (FSCS)



*Bridge to the
Army After Next*



Tactical Reconnaissance Armoured Combat Equipment Requirement (TRACER) Programme



Mounted Scouts & Cavalry In Force XXI and Beyond



Gain Information Dominance

Project the Force

Protect the Force

Cavalry and Scout Forces Provide the
Commander the Capability to:

- Create Time and Space
- Obtain/Verify Current Information
- Preserve Combat Power
- Facilitate Movement

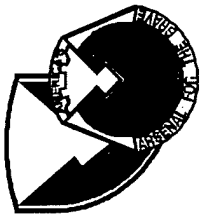
Shape the Battlespace

Decisive attack

Sustain and Transition

9 22 98

Committed to Excellence



Critical Technologies



Bridge to AAN

SENSORS

- Mast Mounted FLIR with Extended Range Optics
- Multi-Function Laser
- Acoustic Sensors
- Active Emitter

Potential Horizontal Applications

SURVIVABILITY

- Signature Management
- HTI Hit Avoidance
- Armor

MOBILITY

- Electric or Conventional Drive
- Semi-active Hydropneumatic Suspension
- Band Track

C4I/ELECTRONICS

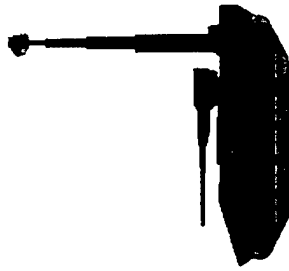
- Advanced Crew Station
- Open Electronic Architecture
- Multi-band, Multi-mode Radio
- Fully Integrated into Digital Battlefield

ARMAMEN

- Medium Caliber Weapon
- Advanced Fire Control

SYSTEM/DEPLOYABILITY

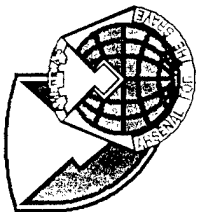
- Advanced Structure
- Hybrid Power System



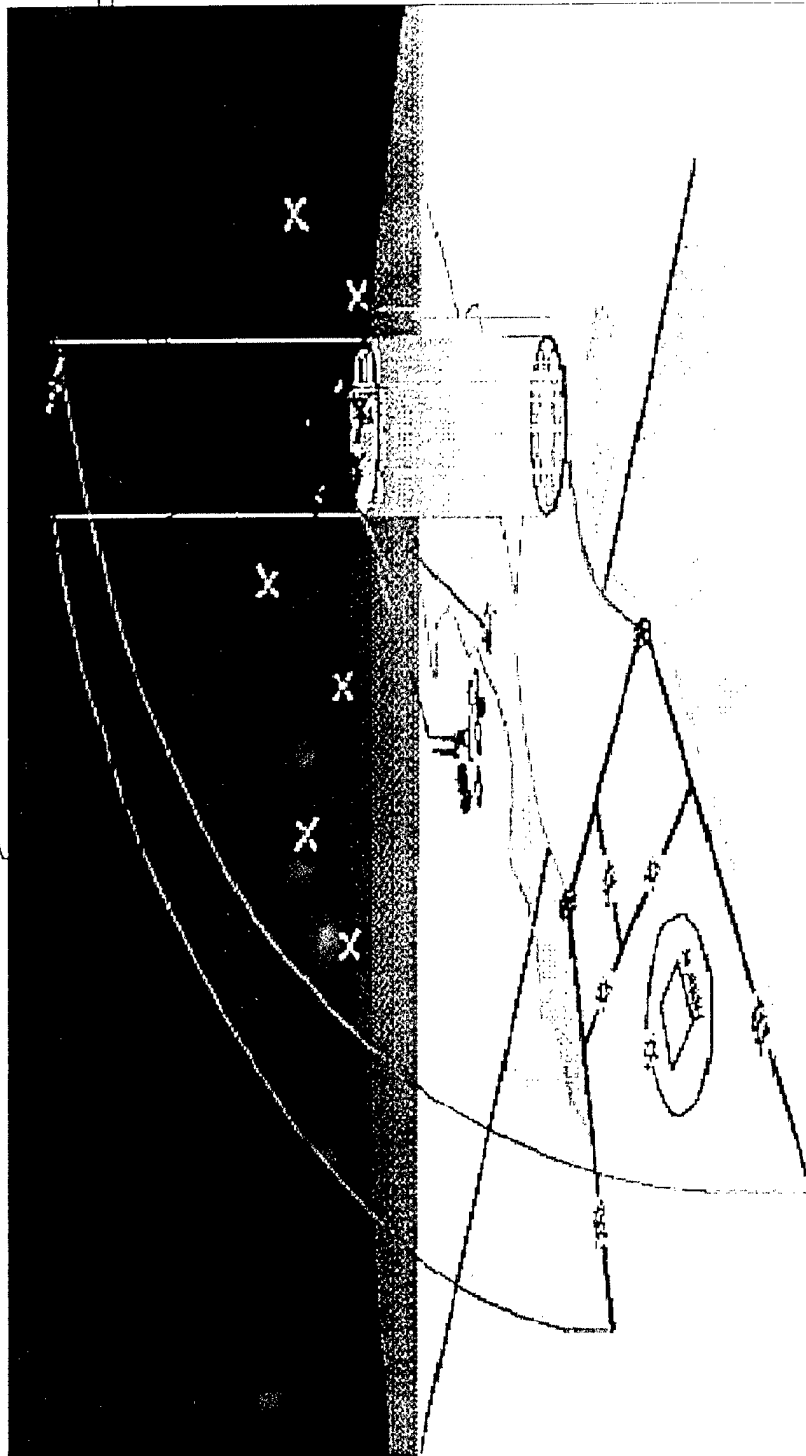
FSCS - A Key Technology Carrier

Committed to Excellence

9/22/98

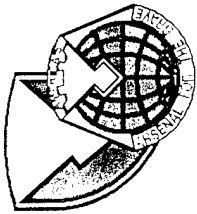


Army After Next

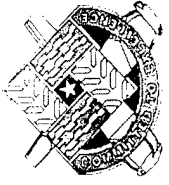


Committed to Excellence

0 22 98



FCS Pre-AAN (2015)



One of the first deployment
driven systems

Circa 1996

Sustainability a premium

User Goals

EM

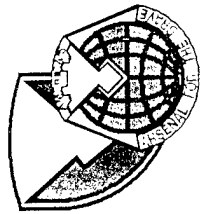
- Deploy 2 Combat Loaded on C17
- Lethal vs all Threats @ 3-5 Km LOS & 10 Km NLOS
- Survivable vs all Threats
- 75-100 kph cross country speed for 500 meters (50 kph sustained)
- 50% reduction in Class III, V, IX
- Situational Awareness/Reduced Crew Fightability

Mid 90's Conceptual Vision
40 Ton Combat System

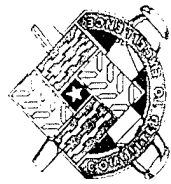
ETC

Committed to Excellence

4.2



40T Concept Vehicle



- Remote Turret

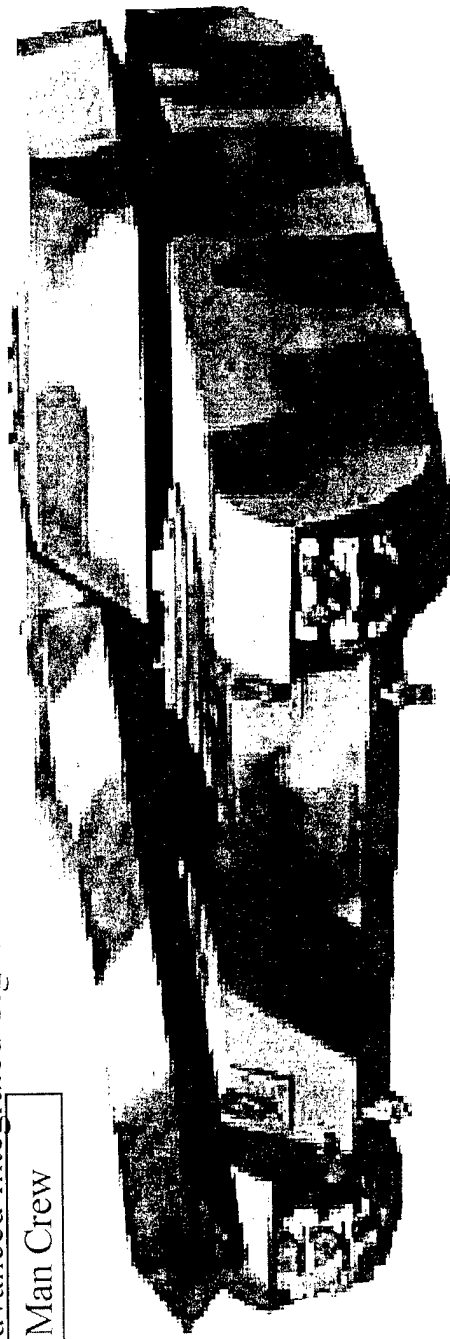
- High Pressure 120mm Gun

- Advanced Integrated Sight

- 2 Man Crew

- 2 Vehicles on C17 (38.7T)

- 50% Reduction in Fuel Consumption



- Hit Avoidance

- Signature Management

- Active Protection

- Advanced Hybrid Armor

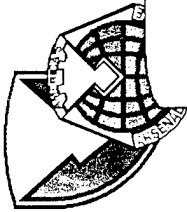
- Electric Drive

- Advanced Diesel or Turbine Engine

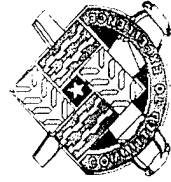
- Variable Height Semi-Active Suspension

9 22 98

Committed to Excellence



FCS AAN (2020+)



Deployability a premium

20 Ton Variant

Lethality and
Survivability a
technical
challenge

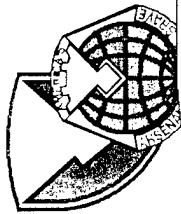
User Goals

- 1 on AAN Advanced Air Transfer
- Lethal vs all Threats @ 3-5 Km LOS/10+ Km NLOS
- Survivable vs direct fire CE, KE, and top attack without heavy armor (Only medium caliber ballistic protection)
- 100 kph cross country burst speed (70 kph sustainably)
- 50%-75% reduction in Class III, V, IX over 30 days
- Situational Awareness/Reduced Crew Fightability

Sustainability a premium

Committed to Excellence

9 22 98



Future Infantry Vehicle Concepts



Primary Goal Troop Carrier with
Advanced Technology

Deployability

Infantry Center Goals

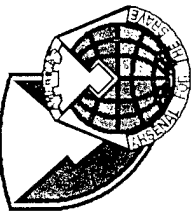
- Deploy 3 combat loaded on C17
- Carry complete Land Warrior Squad
- Survivable vs. Threat
- 75-100 kph cross country speed for 500 meters (50 kph sustained)
- 50% reduction in Class III, V, IX
- Situational Awareness

Agility

Sustainability

9.22.08

Committed to Excellence

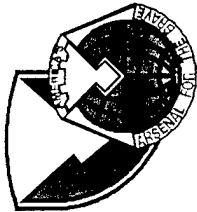


**U.S. Army
Ground
Vehicle
Technology**



Committed to Excellence

9-22-98



Technology Investment Strategy



Lethality

- Electromagnetic (EM)
- Electrothermalchemical (ETC)
- Missile



Mid Term

Key Issue: Integration

Mobility

- Combat Hybrid Power System Demonstrator
- Semi-Active and Active Suspension
- Electric Drive
- Band Track

Mid Term

Structures

- Composites
- Lightweight Chassis & Turret
- Modular Removable Armor
- Crew

Mid Term



Electronics

- Advanced Crew Station
- Weapon System Technical Architecture
- Ground Vehicle Robotics

Mid-Far Term



Survivability

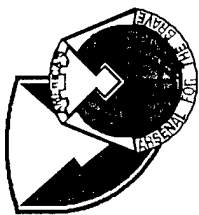
- Future Light Vehicle Ballistic Protection
- Smart Armor
- Low Observables
- Full Spectrum Active Protection
- Laser Protection for Ground Vehicle Vision Systems

Mid Term

Legend

- Current: 0-5 yrs
- Near Term: 5-10 yrs
- Mid Term: 10-15 yrs
- Far Term: 15-20 yrs

Committed to Excellence



Lethality Challenge



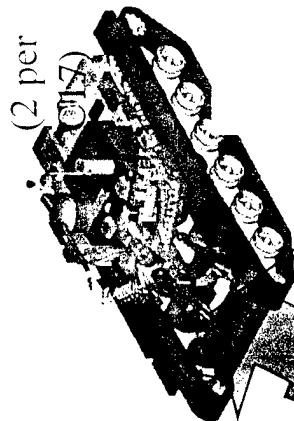
ODS

70 Tons



1996

40 Tons

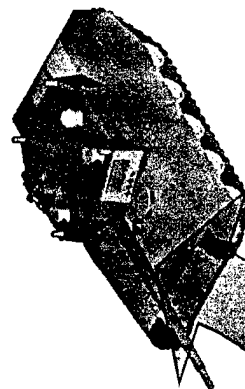


(2 per C130)

1998

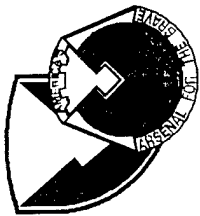
20 Tons

(1 per C130)



9.22.98

Committed to Excellence



EM Armament



Pulsed Power & Cooling

Today: 1 Semitrailer

Railgun

Mid-Term: 1 Conex

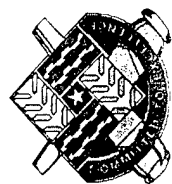
Autoloader & Ammo

Packaging

2015 - 2025
Far Term: 1/2
Conex

Committed to Excellence

9/22/98

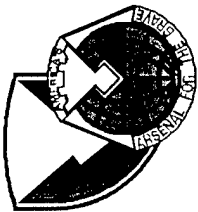


The diagram illustrates the components and requirements for a missile launcher. It is organized into several functional areas:

- Low Electric Power Requirement:** A box on the left side of the diagram.
- High Density Low-Vulnerability Propellants:** A box on the left side, below the first one.
- Compartmentation:** A box in the upper middle section.
- Guidance & Control Miniaturization:** A box on the right side, above the 'Missile' silhouette.
- Insensitive Non-detonable Propulsion:** A box in the center, below 'Compartmentation'.
- Pulse Forming Network Storage:** A box on the right side, below 'Insensitive Non-detonable Propulsion'.
- Re-Arm Materiel Handling:** A box on the right side, below 'Pulse Forming Network Storage'.
- Mid-Term:** A box on the far right side.

Other elements include:

- Missile Launcher:** The main title at the top.
- Missile:** A silhouette of a missile in the center.
- CE P3I:** A missile image on the right.
- CKEM:** A label near the 'Missile' silhouette.
- Re-Arm Materiel Handling:** A box on the right side.
- Mid-Term:** A box on the far right side.
- Compact TERM-KE ('Rhino'):** A missile image on the right.
- Competent KE:** A missile image on the right.
- XN908 ('Hammer'):** A missile image on the right.
- Pulse Power Supply:** A box on the left side.
- Power Rod:** A label pointing to a component in the 'Pulse Power Supply' box.
- Prime Power:** A label pointing to a component in the 'Pulse Power Supply' box.
- Assembly:** A label pointing to a component in the 'Pulse Power Supply' box.
- Block Block:** A label pointing to a component in the 'Pulse Power Supply' box.
- KE M...**: A label pointing to a component in the 'Pulse Power Supply' box.



VETRONICS

- Where am I?
- Where are my Friends?
- Where is the Enemy?

WEAPON SYSTEM TECHNICAL ARCHITECTURE (WSTA)

Operational Architecture

Systems Architecture

Technical Architecture

Army Enterprise Architecture

CREW STATION TECHNOLOGY APPLICATION



Technology Challenges

- Cybernetics
- Voice Control
- 3D Audio
- Decision Aids
- Panoramic Displays
- Technical Architecture

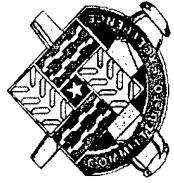
AVAILABLE FOR NEAR TERM TECH DEMOS

Universal Applications

- Soldier-Machine-Interface
- C² Tactical Display
- Technical Architecture

- Increased Crew Effectiveness
- Potential Reduced Crew Size
- Reduced Vehicle Size/Weight

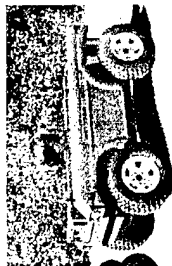
Committed to Excellence



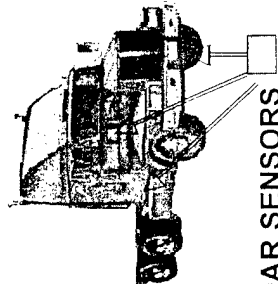
GROUND VEHICLE ROBOTICS APPLICATIONS



Semi-Autonomous Driving



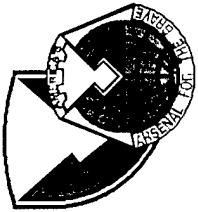
Autonomous Recon



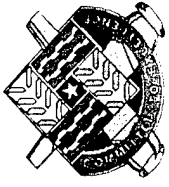
RADAR SENSORS

Collision Avoidance

Mid-Term



Structures



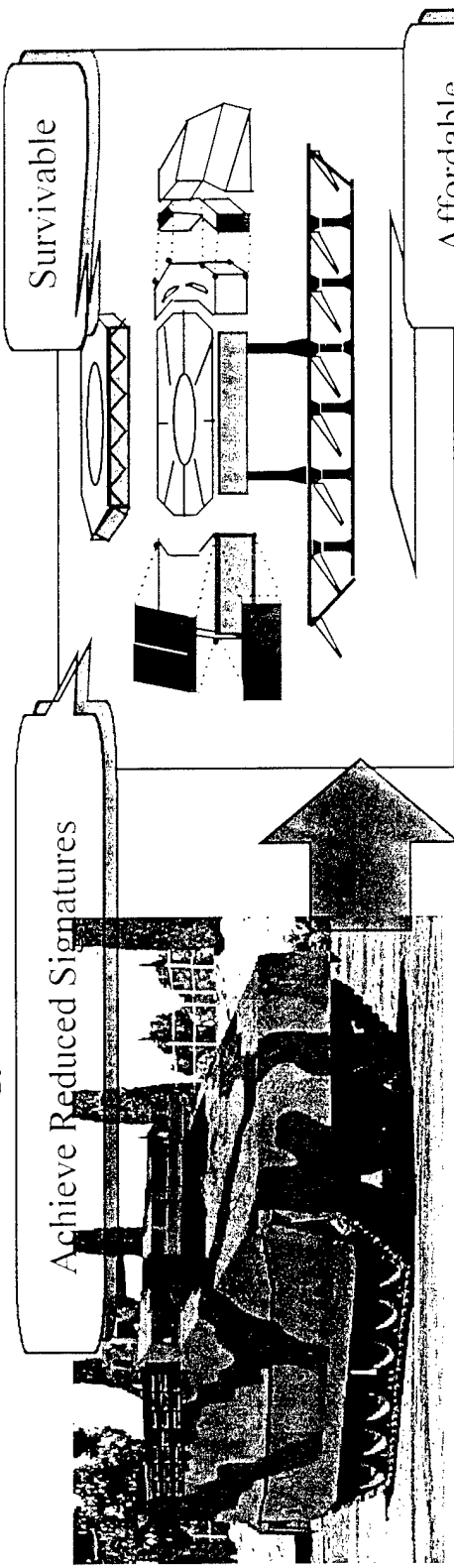
1996

2010+

Composite Armored Vehicle
Advanced Technology Demonstrator

Light Weight Chassis & Turret

Achieve Reduced Signatures



Monocoque

Demonstrated weight reduction of 33% of structure and armor when compared to equivalent aluminum vehicle. Sandwich construction using layers of fiberglass, ceramic armor tile, and signature management materials.

Current

Mobile

Space Frame

Demonstrate a 30% weight reduction improvement in the structure

- Modular Removable Armor
- Truss / Space Frame Structure
- Minimum Gage-Stiffened Skin Basic Vehicle Cover

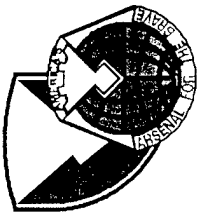
Far-Term

- Encapsulated Crew
- Replaceable High Energy Belly Plate

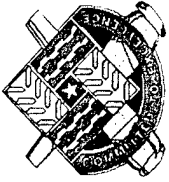
Affordable

Committed to Excellence

9/22/98



Enhanced Mobility Technologies



Band Track

Noise Signature Reduction 30% - 50%

Active Track Tensioner

4000 mile maintenance free

Near-Term

Maintainability

Semi-Active Suspension

40% cross country speed increase in near term

Near Term

Maximize cross country mobility with zero weight and volume impact

Active Suspension

Improve X-Country Speed 100%

Intelligent Preview Active Suspensions

Electro-mechanical suspension to provide 100% increase in cross country speed by 2015

Mid-Term

Terrain Sensing

Electric Drive

Increase Operating Range 50%

Increase Power Density (HP/ft³) 50%

Increase Power Electronics Capability 100%

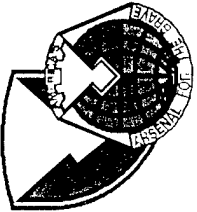
40% Reduction in fuel consumption

Far-Term

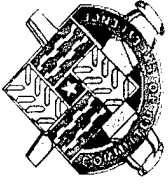
High Temperature Silicon Carbide Switches

High Discharge

Energy Storage

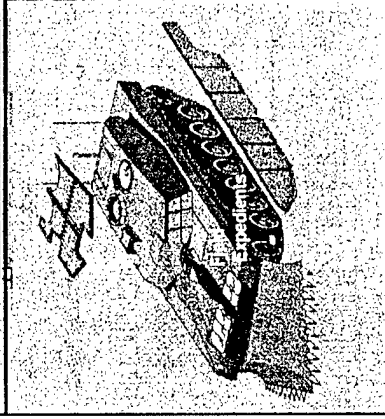
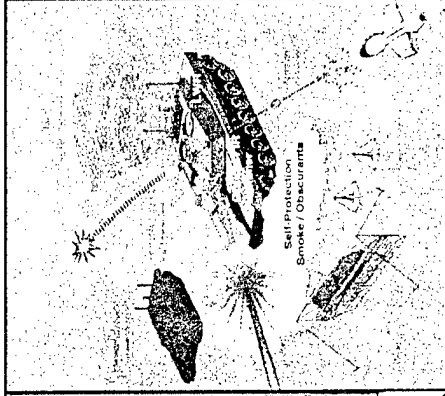
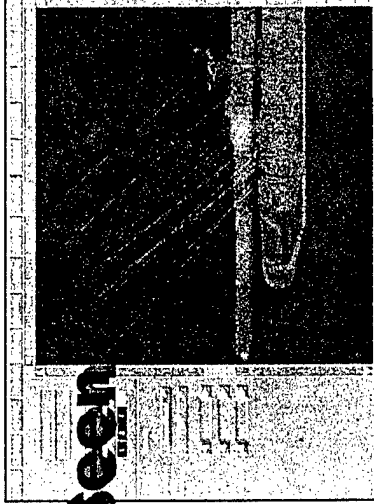


Survivability



Don't Be Seen

- Low Observable Technology

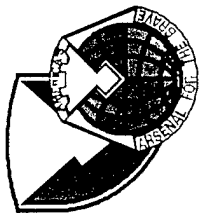


- Advanced Light-Weight Armor



Don't Be Hit

- Active Protection Systems
- Automated Fire Suppression



Signature Management



• Develop and demonstrate optimized vehicle components which will provide reduced signatures

- 50-75% Less Detectable = more survivable
- Signature/EW/Armor Integrated/Optimized Solution
- Optimization means less weight = more survivable
- Risk reduction for Future Systems

Typical Components

Signature Management
Treatment Durability

- Signature Reducing FLIR Micromesh window

25 MM GUN

2 MAN TURRET

400 HP DIESEL ENGINE

SMITHSON

GAL

- New lightweight low signature grille with improved ballistics

Accurate Environment Effect Modeling

- Reduced Signature ballistic side panels with reduced weight

Conceptual Future Scout Vehicle

Affordability

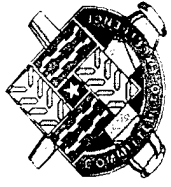
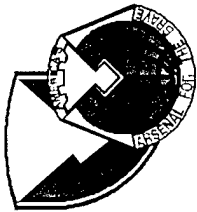
Committed to Excellence

Threat Info User Requirements

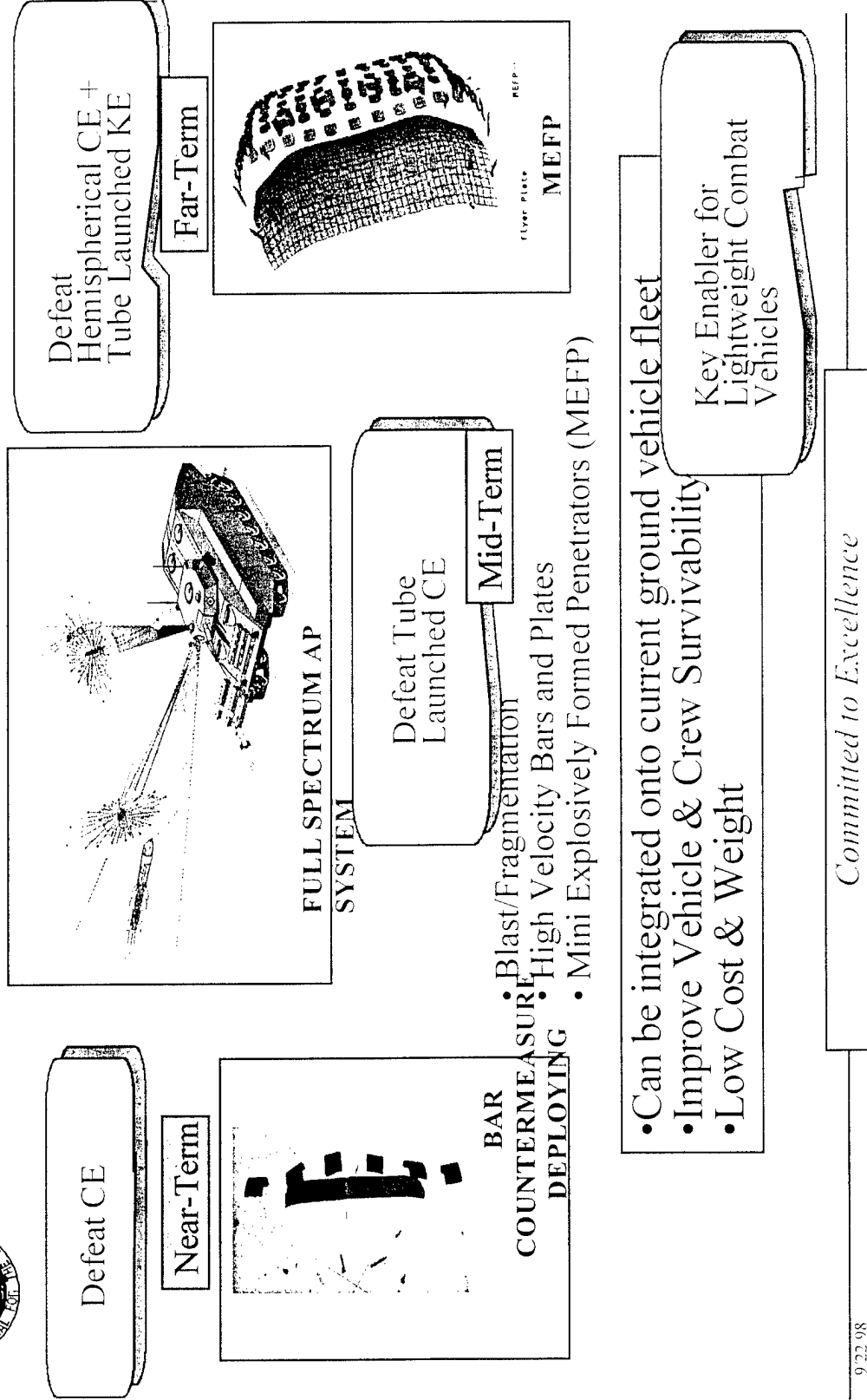
CAD/Virtual Prototyping

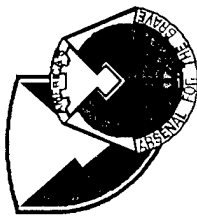
Modeling and Simulation

Fab and Demo/Test

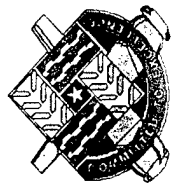


Full Spectrum Active Protection





Future Light Vehicle Ballistic Protection Technology



OBJECTIVE

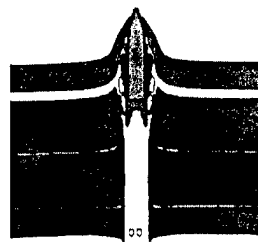
- Demonstrate new armor systems designed to provide vehicles in the 18-40 ton range protection against the future medium caliber cannon threat, light and medium shaped charge threats, top attack weapons, and mines
- Systems will be compatible with advanced structural technology likely to be used in future light vehicles
- Utilize advanced defeat mechanisms
- Designed to avoid adverse impacts on mission equipment and other survivability measures

At < 30 Tons
Defeat Medium
Caliber Threats



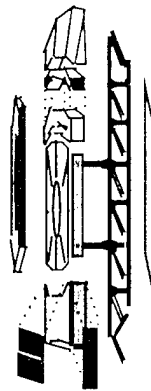
Mid-Term

Develop max protection possible for fixed areal density



Armor/structure integration & optimization

Develop minimum weight armor/structure for given protection requirement



Experimental Validation

Advanced Structures

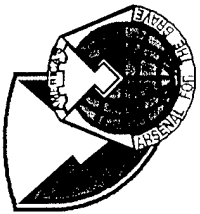
Modeling and Analysis

Weight/Space Efficient, Affordable Ballistic Protection

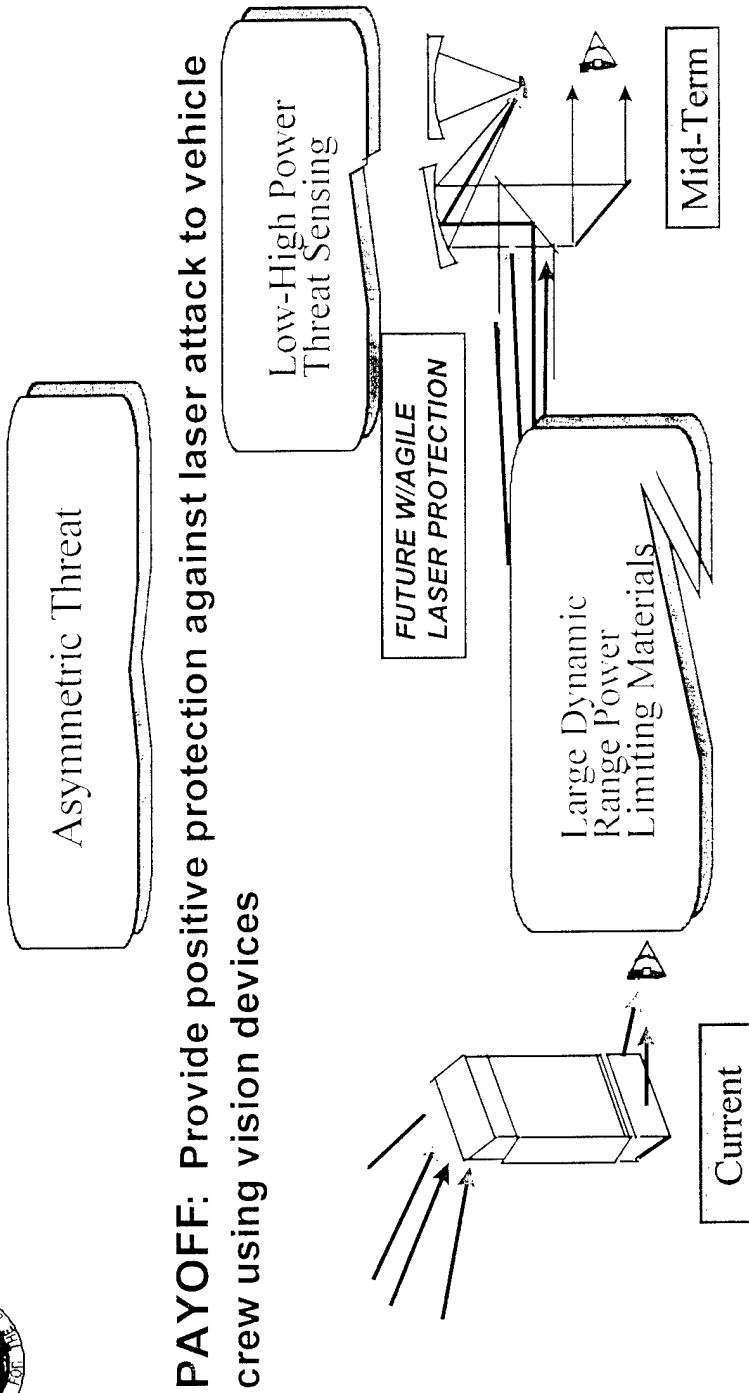
Material Development

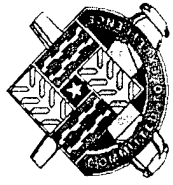
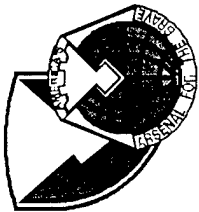
9/22/98

Committed to Excellence

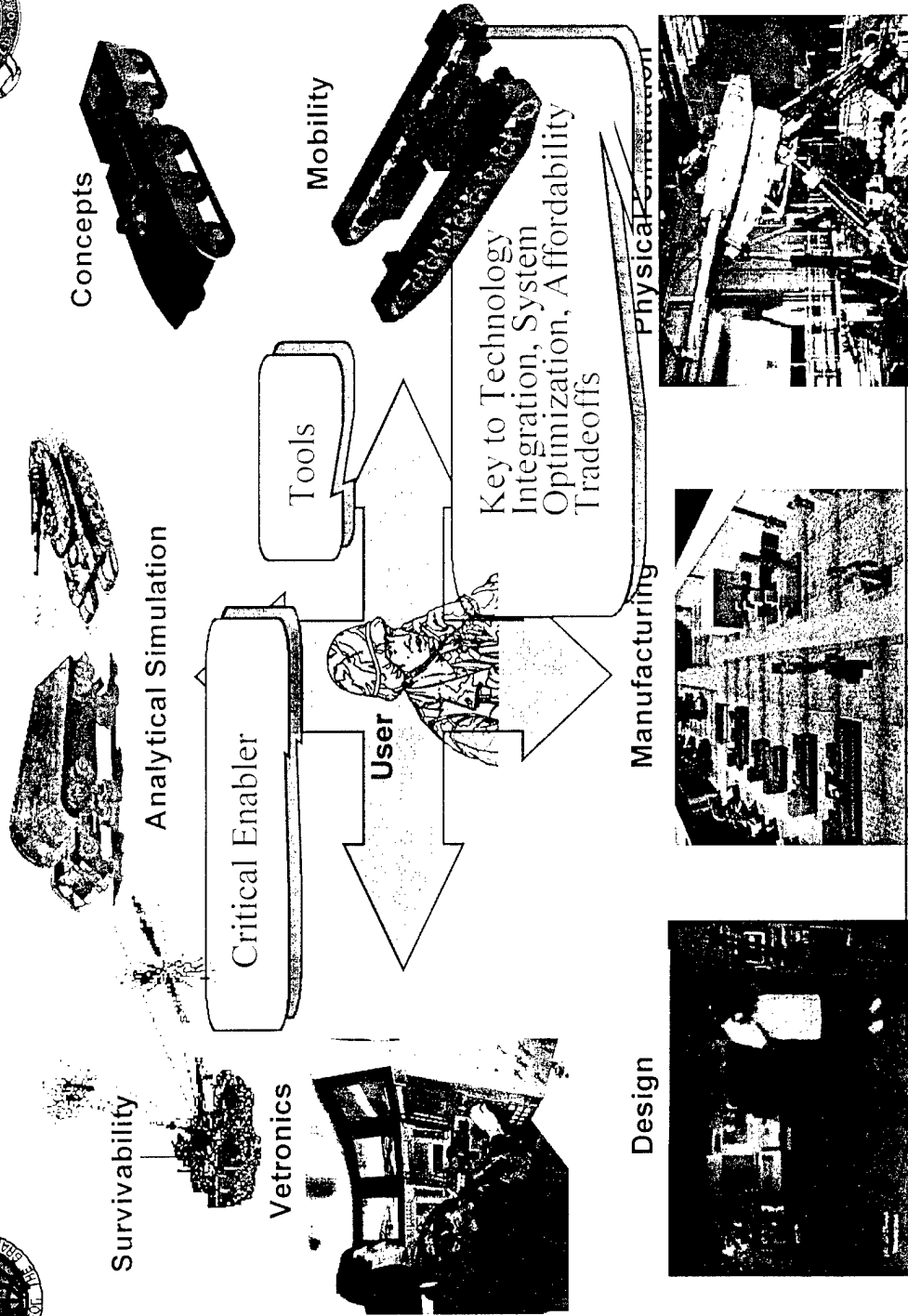


Laser Protection For Ground Vehicle Vision Systems



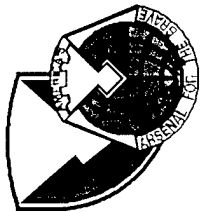


Modeling & Simulation



9 22 98

Committed to Excellence

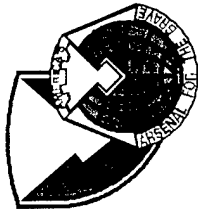


TACOM is ...



9 22 98

Committed to Excellence

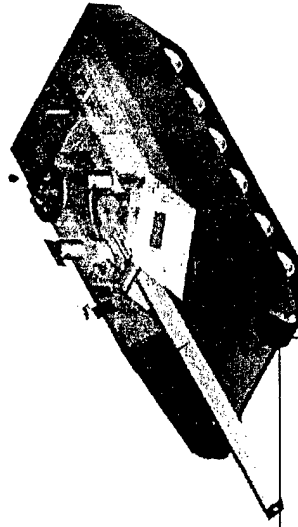


SUMMARY



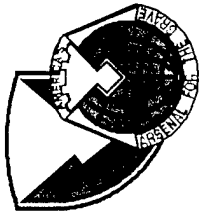
- TACOM - A KEY PLAYER IN SUPPORT OF LEGACY SYSTEMS
- TACOM PROVIDES R&D TECH BASE VISION AND UNIQUE INTEGRATION EXPERTISE IN SUPPORT OF THE USER

TACOM WILL BE AN ACTIVE PARTNER NOW AND INTO THE FUTURE



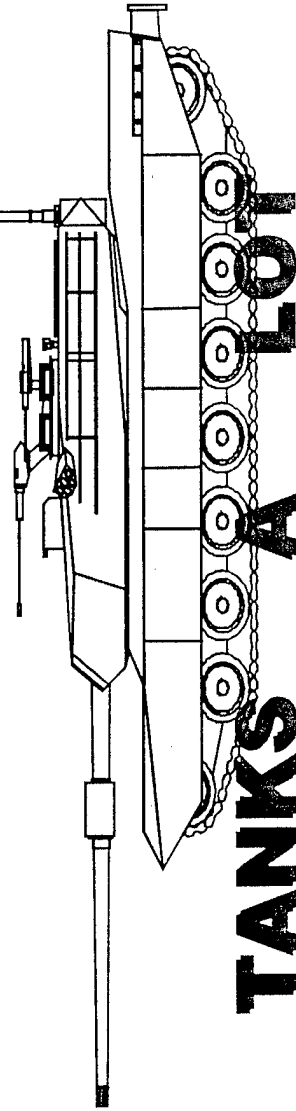
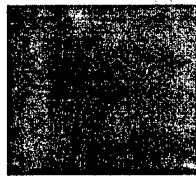
9/22/98

Committed to Excellence

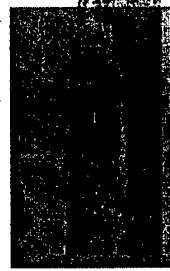
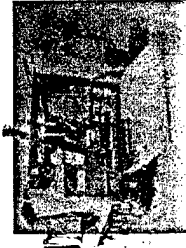


TACOM

*Mobility and Firepower
for America's Army*



TANKS A LOT



428 98

Mobility and Fire Power for America's Army

35 35

62

1998 Combat Vehicle Conference

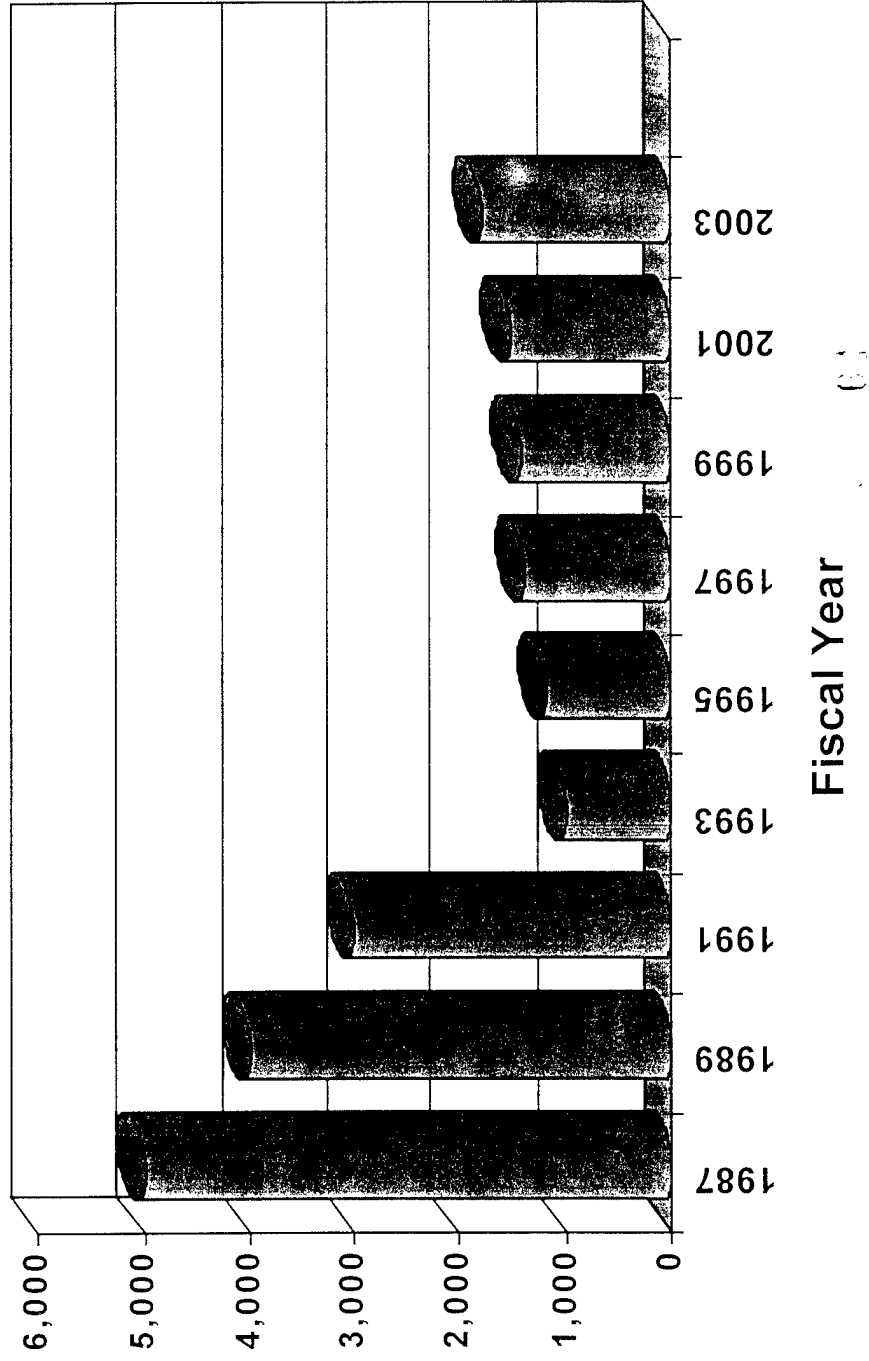
United States

Sustaining the Combat Vehicle Industrial Base

**“Why Care if the Combat Vehicle Industrial
Base is Sustained?”**

Tom Rabaut
President and CEO
United Defense L.P.
September 22, 1998

Tactical Combat Vehicle (TCV) Procurement \$M

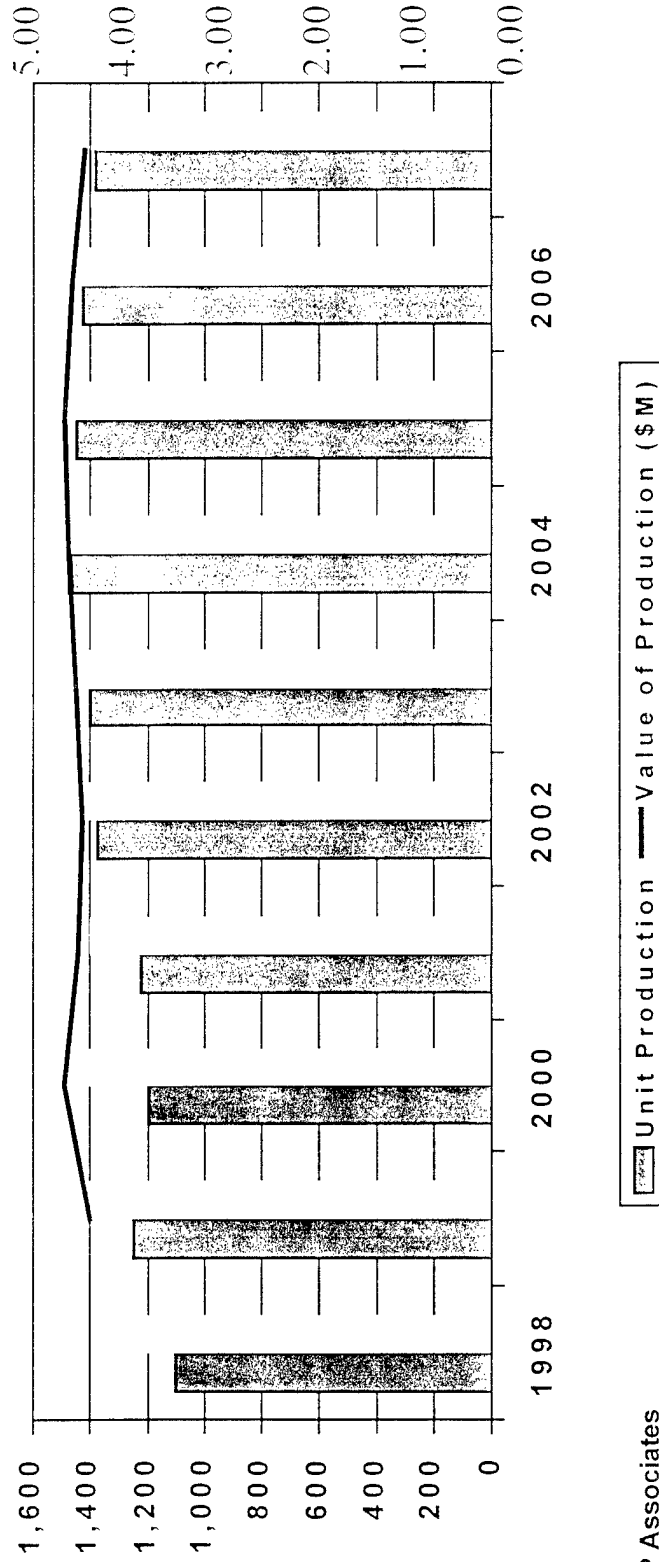


Tanks

Units

- ? Global demand for tanks remains steady
- ? Tank Market: \$49B market over 10 years

Tank Market 1998-2007:
Units Produced & Production Value



CSP Associates
August 1998

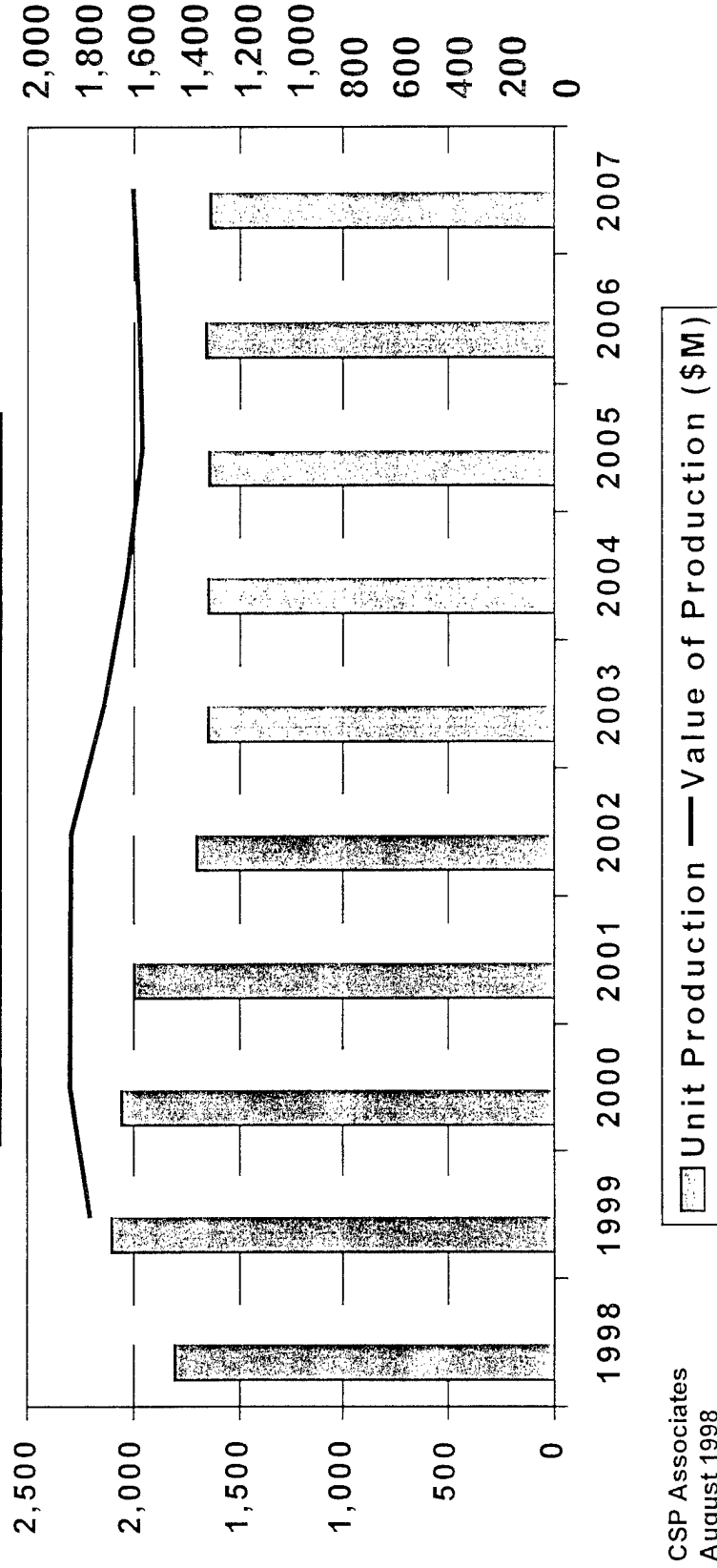
Light Tracked Vehicles (LTV)

Unit f ns

- ? Near term demand is healthy
- ? LTV market: \$17.1B over 10 years

LTV Market 1998-2007:

Units Produced & Production Value



Self-Propelled Artillery Systems

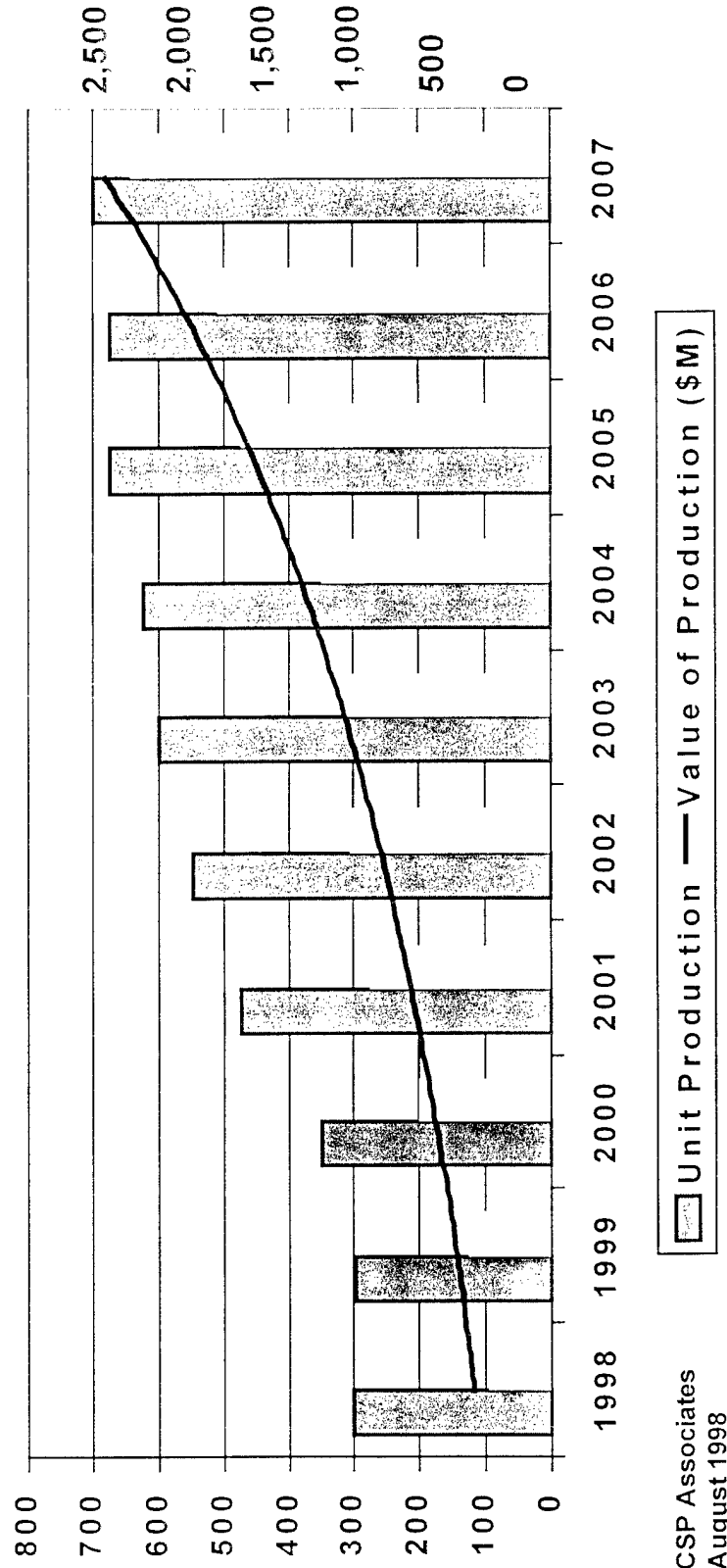
Unit f ns

? Demand remains high

? Self-propelled artillery market: \$10B over 10 years

Self-Propelled Artillery Market 1998-2007:

Units Produced & Production Value

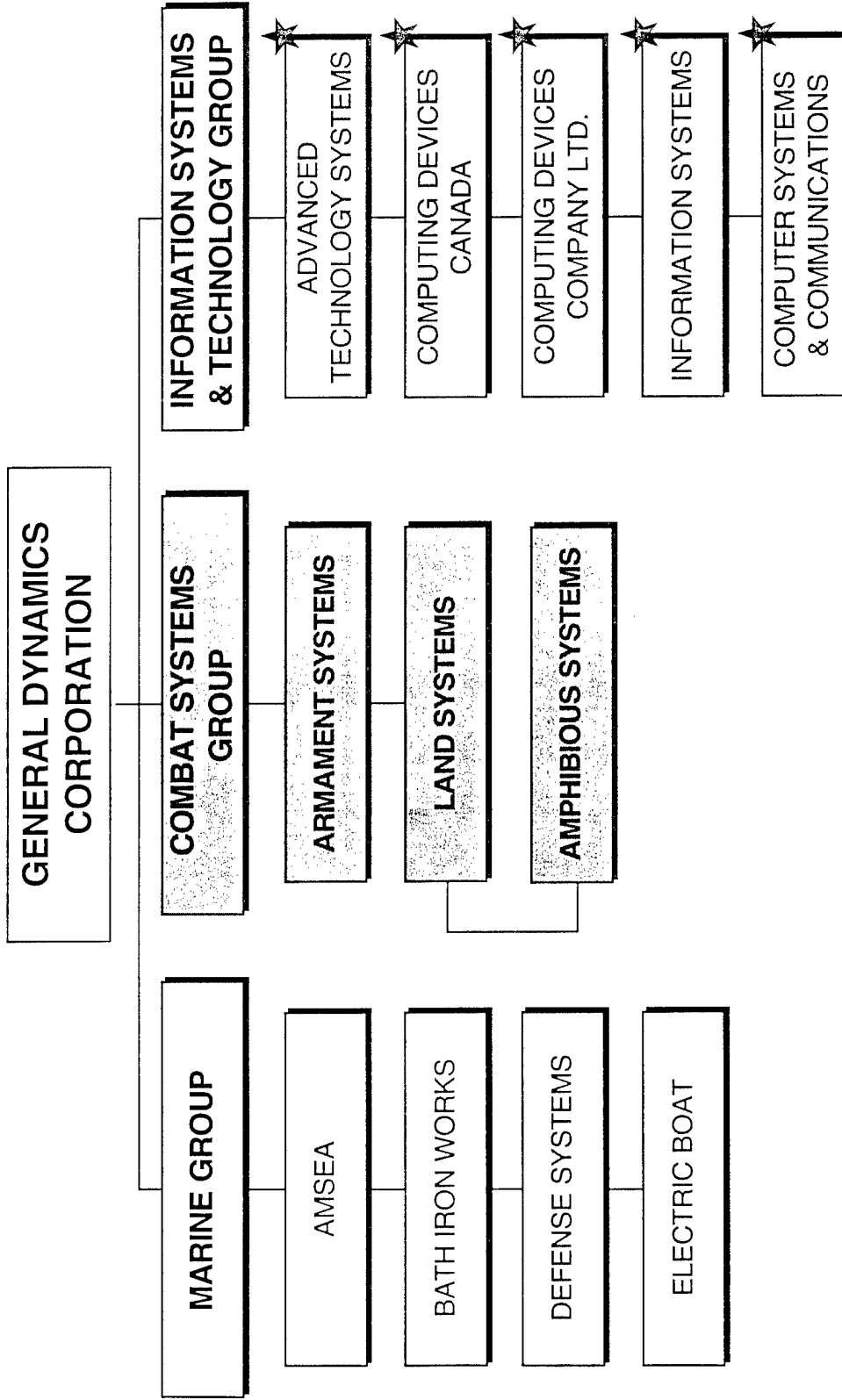


1998 COMBAT VEHICLE CONFERENCE

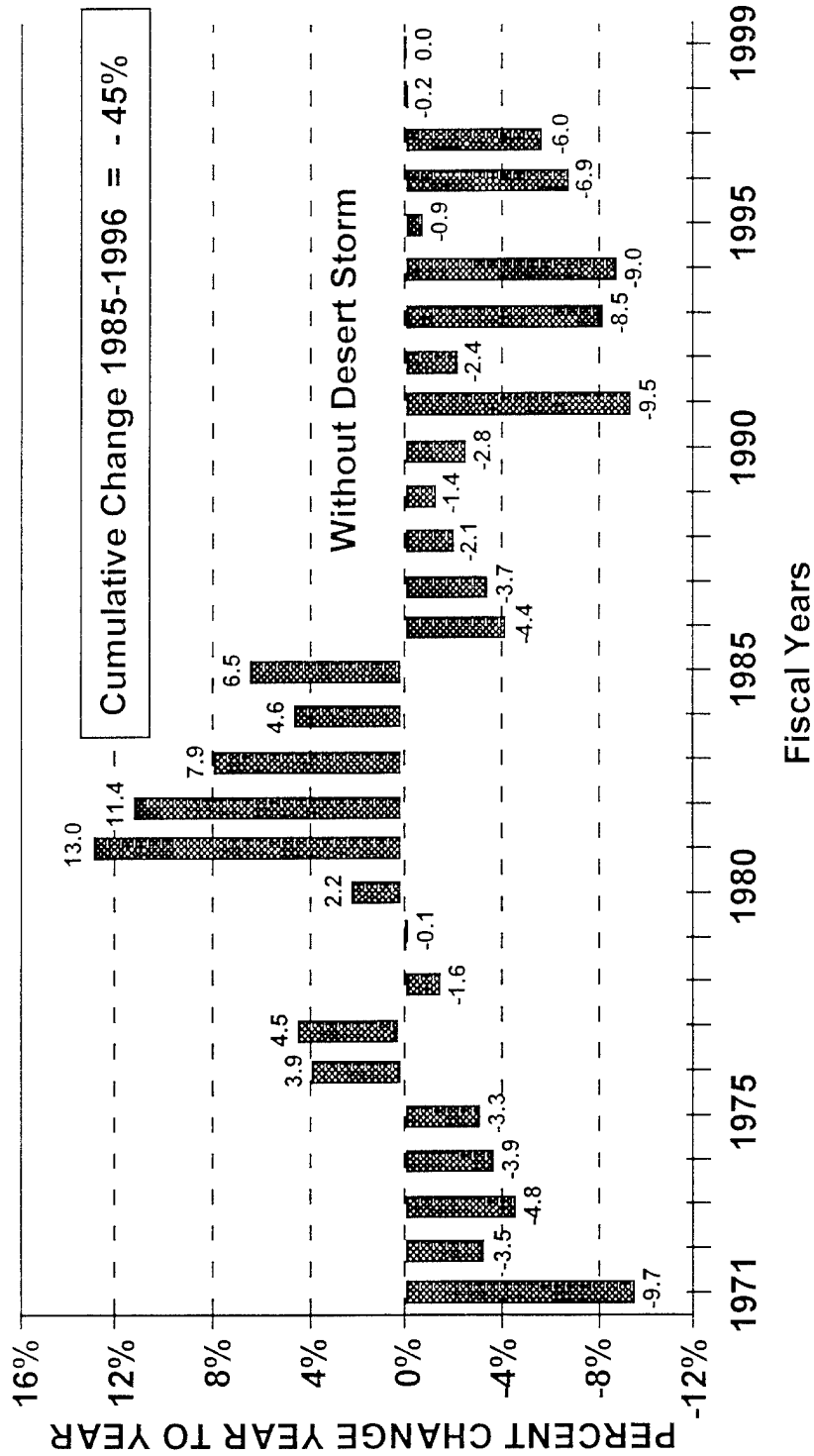
SUSTAINING THE COMBAT VEHICLE INDUSTRIAL BASE

Charles M. Hall
Vice President, Production and Delivery
General Dynamics Land Systems

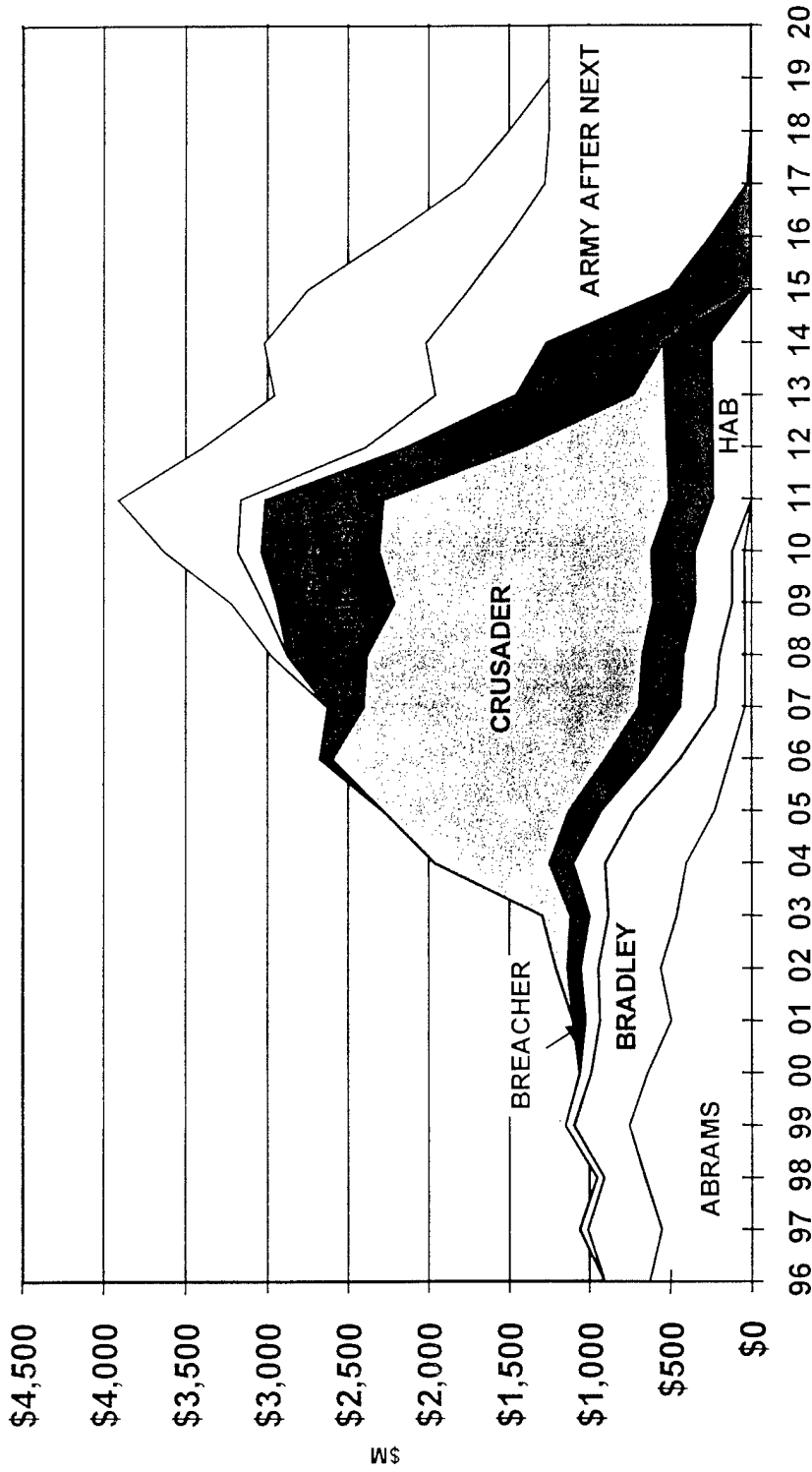
ORGANIZATION



PERCENT CHANGE IN REAL DEFENSE BUDGET AUTHORITY



U.S. ARMY COMBAT VEHICLE PROCUREMENT PROJECTIONS



Can We Afford the Future?

THE RISK OF NO INDUSTRIAL BASE IS TOO GREAT!

WITHOUT INDUSTRIAL BASE

- OUR GREATEST ASSET - THE U.S. SOLDIER - MUST FIGHT WITH LESS THAN THE BEST EQUIPMENT
- PROGRAMMATIC FUNDING AND CONGRESSIONAL SUPPORT, LIKE THE INDUSTRIAL BASE, WILL HAVE TO BE RECONSTITUTED FOR AAN
- TECHNOLOGY WILL SHIFT AWAY FROM MILITARY APPLICATIONS IMPACTING ARMY'S ABILITY TO ACHIEVE AAN
- THE U.S. WOULD BE THE ONLY INDUSTRIAL NATION WITHOUT COMBAT VEHICLE PRODUCTION CAPABILITIES
- FLEET SUSTAINMENT OF OBSOLETE TECHNOLOGY WILL PLACE INCREASED BURDEN ON OPERATIONAL READINESS

NO INDUSTRIAL BASE . . . A RISKY PROPOSITION

INDUSTRY TRENDS TO ADDRESS SHRINKING SALES BASE

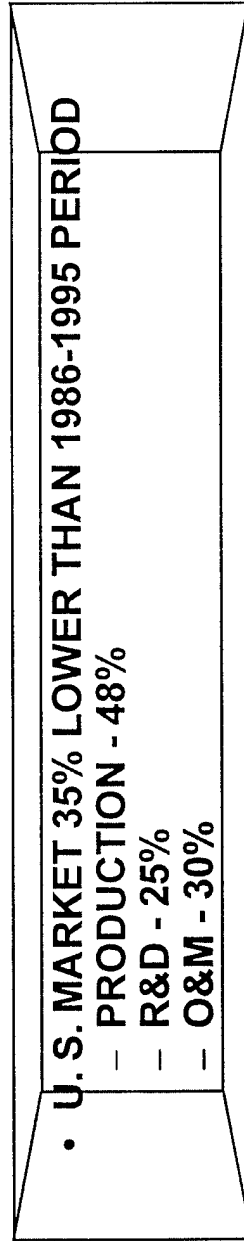
- **MERGERS AND ACQUISITIONS**
 - Lockheed Martin / Raytheon, Hughes, TI / Boeing
McDonald Douglas
 - Significant Increase in Mergers Since the End of
the Cold War
- **TEAMING AGREEMENTS**
 - Dow Corning, GDLS / MTU, Matra BAe Dynamics
- **PRIVATE / PUBLIC INDUSTRY PARTNERSHIPS**

INDUSTRY, LIKE THE ARMY, HAS A
SIGNIFICANT CHALLENGE TO OVERCOME

COMBAT VEHICLE WORLD MARKET AVERAGE ANNUAL MARKET 1996 - 2005

| | U.S.* | % | REST OF WORLD* | % | TOTAL* | % |
|-----------------------------|-------|-----|-------------------|----|--------|----|
| PRODUCTION | \$1.5 | 7 | \$8.5 | 37 | \$10.0 | 44 |
| DEVELOPMENT | \$0.9 | 4 | \$1.7 | 7 | \$2.6 | 11 |
| OPERATIONS & MAINTENANCE | \$3.6 | 15 | \$6.8 | 30 | \$10.4 | 45 |
| TOTAL | \$6.0 | 26% | \$17.0 | 74 | \$23.0 | 10 |

* \$'s in Billions



MUTUAL SOLUTIONS

- PROVIDE RAPID RESPONSE (150 DAYS) MAINTENANCE REPAIR PARTS FOR IN-PRODUCTION HARDWARE
- MULTI-YEAR PROCUREMENT
- SUPPORT FOR INTERNATIONAL SALES
- PARTNERSHIP WITH SERVICES
- PROVIDE CRADLE TO GRAVE OR ARMS AROUND SUPPORT
- REDUCE OWNERSHIP COSTS

FOCUS TO PROVIDE STABILITY
FOR CORE CAPABILITIES

CRADLE TO GRAVE PARTNERSHIPS

“Unless the Army Figures Out How to Move a Legacy System Into a Cradle to Grave Partnership, Significant Savings Will Not Appear Until Long After the Army has Cut the Workforce, Responded to the Quadrennial Defense Review and Downsized. The Bottom Line is to Provide as Good or Better Service to the Warfighter Without Further Burdening the Soldier”

•

LTG PAUL KERN

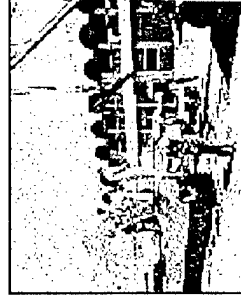
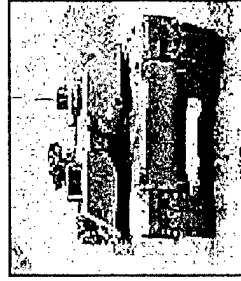
A DRAFT WHITE PAPER ON CRADLE-TO-GRAVE
PARTNERSHIPS - AUGUST 1998

FUTURE BUSINESS

U.S. ARMY

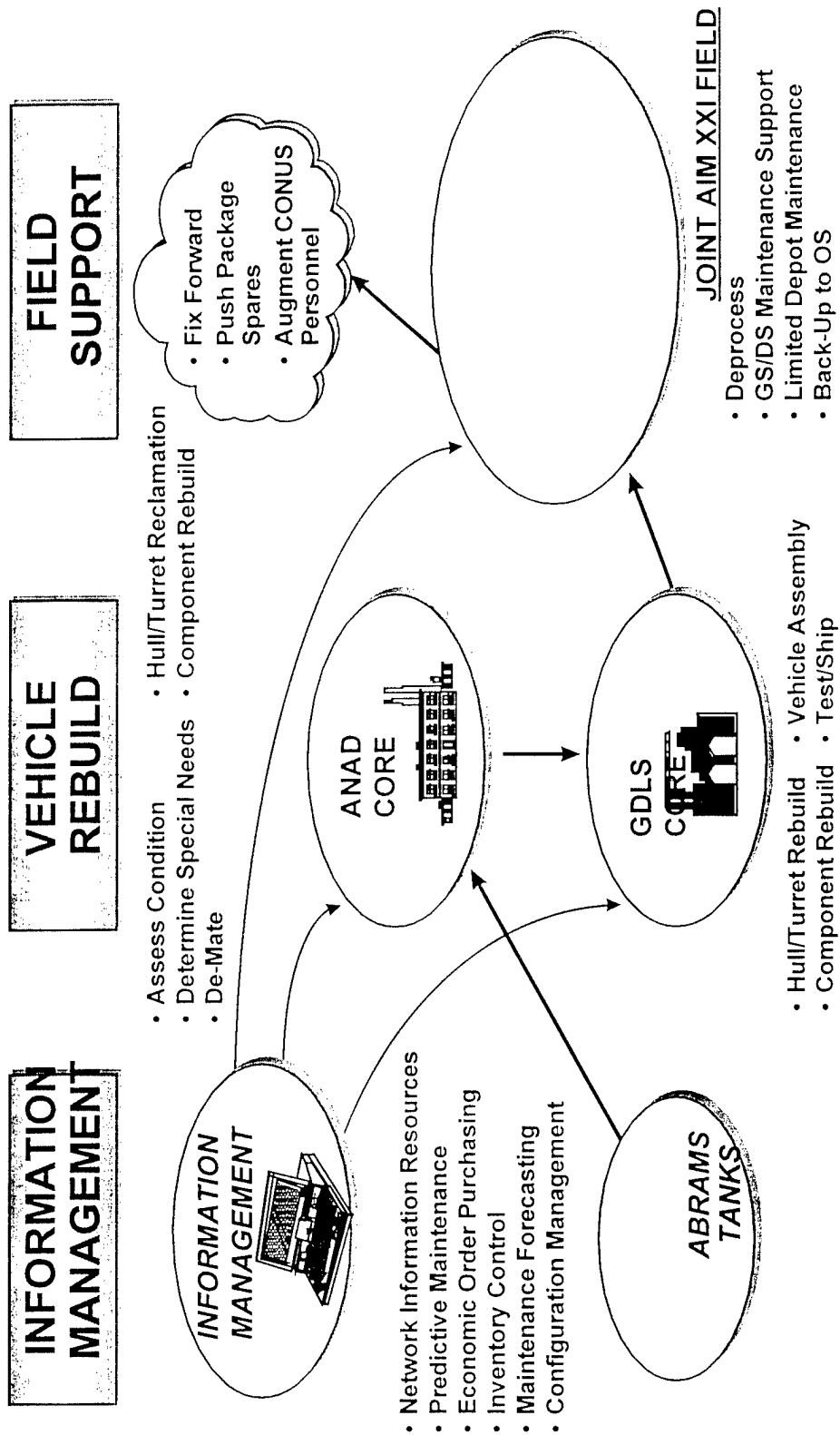
- ABRAMS FLEET LOGISTICS REPORT SUPPORT
 - Life Cycle Support to be Provided by GDLS
 - Configuration Management
 - Total Package Fielding
 - Field Maintenance Above Direct Support
 - Spare and Repair Parts Inventory Management
 - Field Service, Training and Modifications
 - Repair and Upgrade

“CONTRACTOR LOGISTICS SUPPORT”



CURRENTLY PURSUING A 2 YEAR FFP CONTRACT FOR
THE M1A2 TANK AT FT. HOOD AND FT. CARSON

AIM XXI

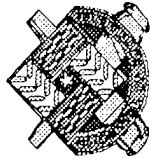


SUMMARY

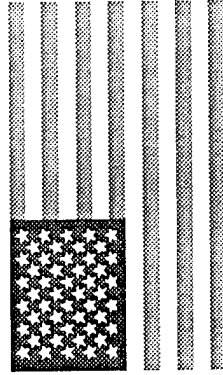
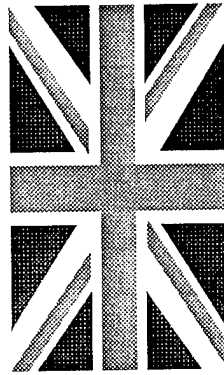
- CORPORATE AND MILITARY ROLES ARE CANDIDATES FOR CHANGE
- READINESS / TECHNICAL SUPERIORITY IS FIRST
- INDUSTRY INVOLVEMENT CAN SUPPORT MUTUAL OBJECTIVES AND STRENGTHEN THE INDUSTRIAL BASE



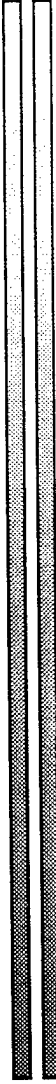
Future Scout & Cavalry System and Tactical Reconnaissance Armoured, Combat Equipment Requirement, FSCS/TRACER Program



TACOM

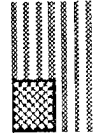


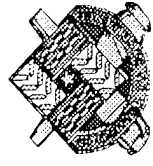
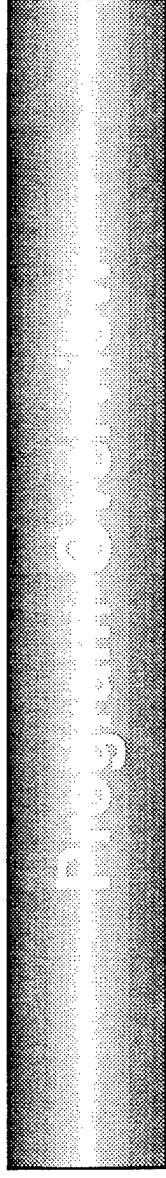
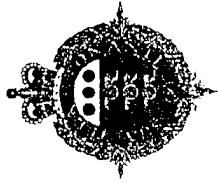
COL PETER WALL
PM, TRACER



Out of the Gate

ROLAND A. ASOKLIS
PM, FSCS

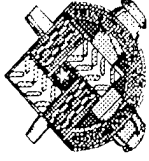
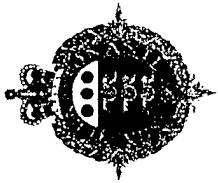




TACOM

- ⇒ Context
- ⇒ Collaboration
- ⇒ Challenges of PD/ATD
- ⇒ Conclusions

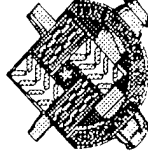
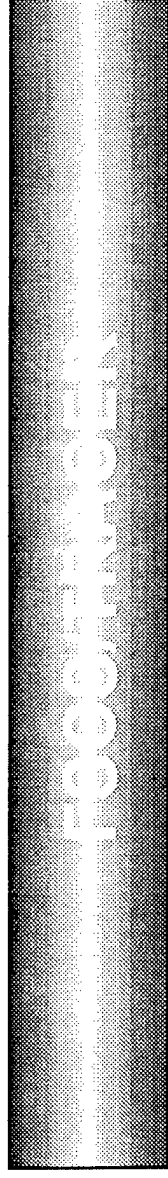
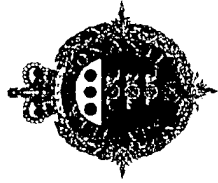




TACOM

Context

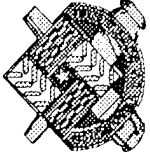
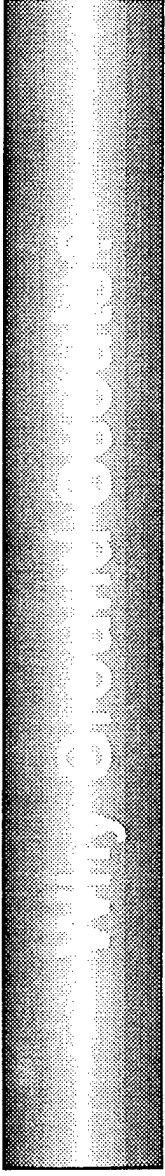
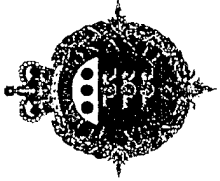




TACOM

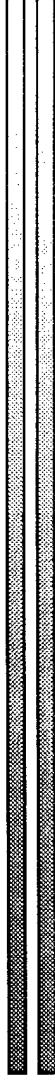
- ⇒ Part of a Balanced ISTAR Mix
- ⇒ Bridging Force XXI and AAN
- ⇒ Integrated into Digitized Battlespace
- ⇒ Employed in Deep and Close Battle
- ⇒ Interact with Direct and Indirect Fire Assets
- ⇒ Enable Decisive Mounted Operations through Information Dominance
- ⇒ Operate across Conflict and Environmental Spectrum

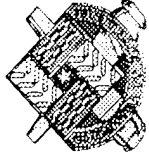
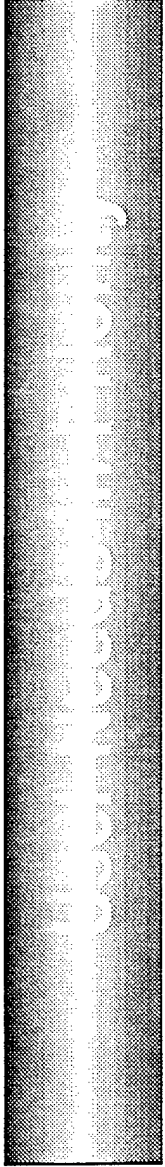
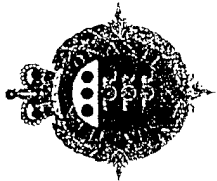




TACOM

- ⇒ Continuous Operations
- ⇒ All Weather Capability
- ⇒ On Site Human Judgment
- ⇒ Probe Deception

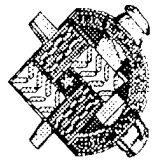
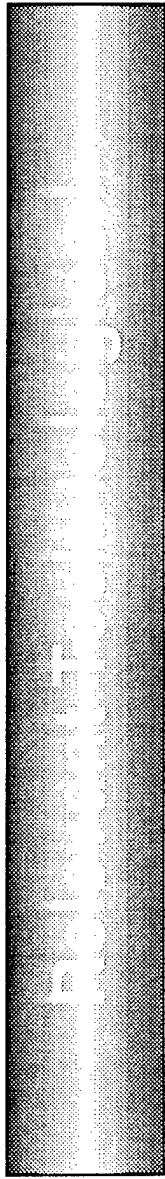
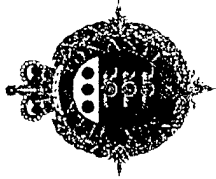




TACOM

- ⇒ Information Gathering
- ⇒ Survivability - Signature Management
 - Physical Protection
 - DAS
- ⇒ C4I
- ⇒ Mobility, Including C130 Transportability
- ⇒ Lethality
- ⇒ Growth
- ⇒ Life Cycle Cost - Effectiveness
- ⇒ Ease of Training - Reduced TADSS





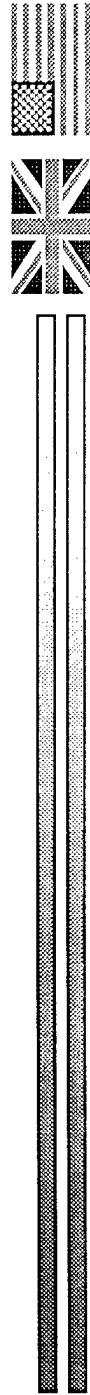
TACOM

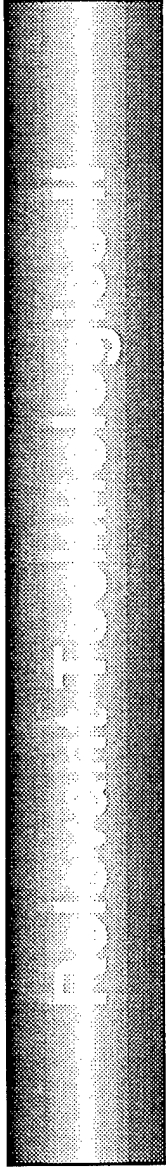
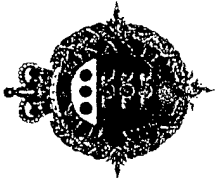
Information Warfare:

- Multi-Spectral Sensor Suite
- Automatic Target Detection/Recognition
- Advanced C4I
- Crew Stations with Advanced Interfaces

Survivability:

- Low Profile
- Stealth in All Spectra
- Advanced Structure with Modular Armor





TACOM

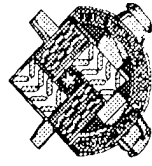
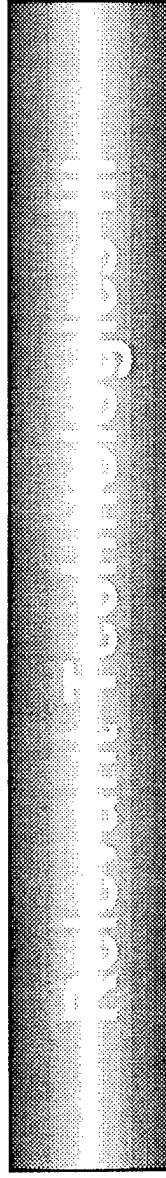
Mobility

- High Power Density Engines
- Semi-Active Suspension
- Hybrid Electric Drive

Lethality

- 35-40mm Cannon
- Case-Telescoped Ammunition
- ATGW Variant for UK





TACOM

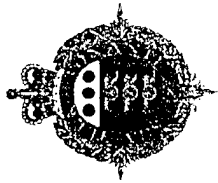
Growth

- Modularity
- Upgradeable Components
- Open Systems Architecture

Reduced TADSS

- Embedded Training

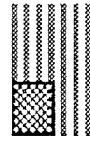
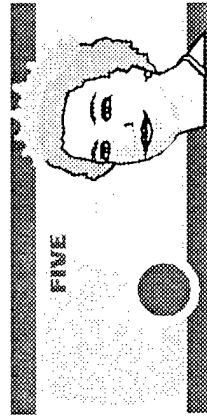
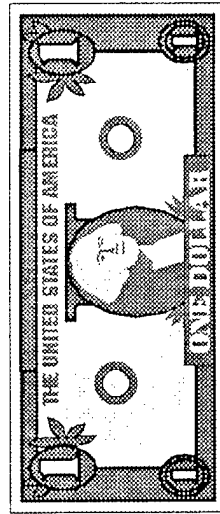


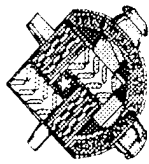
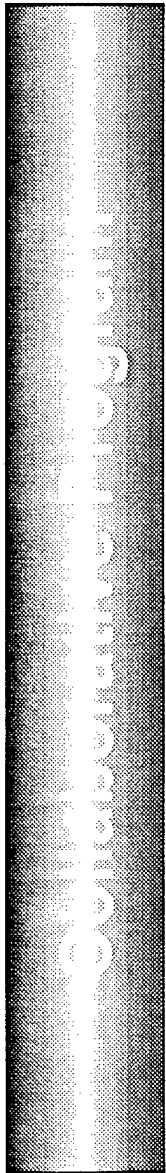
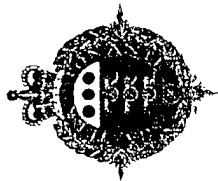


BUT.....

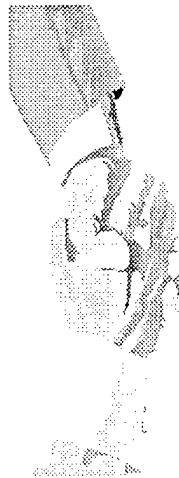
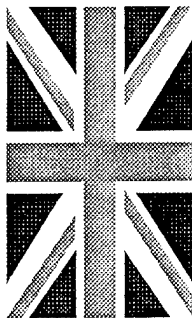
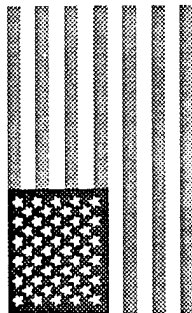
**financial constraints
imply the need for....**

COLLABORATION

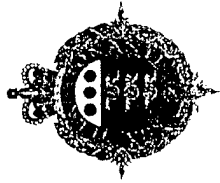




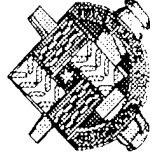
TACOM



03

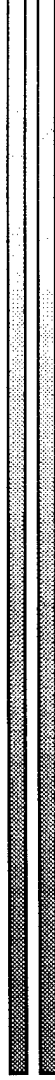


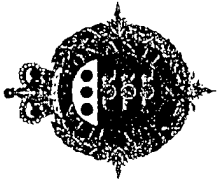
US/UK ESCORT/TRACEP Statement of Intent



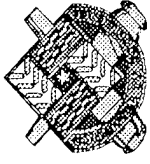
TACOM

- ⇒ Purpose: Explore Common Areas for Cooperation on a Future Armored Reconnaissance Vehicle:
 - Harmonization of National Requirements
 - Procurement Strategy and Implementation of a Joint Advanced Technology Demonstrator/Project Definition Phase
 - Joint Management of ATD/PD Phase
 - Technology Sharing
 - Potential for Cooperation Beyond First Phase



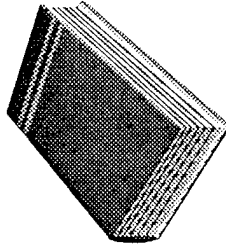


Combined Operational Requirements Document (CORD) Harmonization



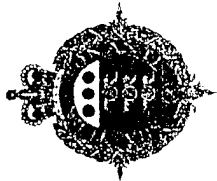
TACOM

- ⇒ Drawing on Existing US/UK Studies
- ⇒ Minor Variation on Concept of Use and Doctrine
- ⇒ User Negotiations Harmonized All CORD Requirements
- ⇒ Critical Negotiated Requirements:
 - OMS/MP, Lethality, Air Transportability



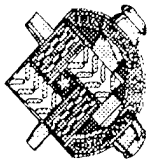
Common Requirements Essential
Prerequisite for Collaborative Program





Procurement Strategy

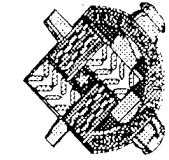
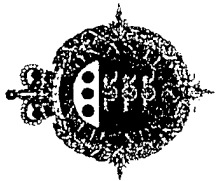
Harmonization of PD/ATD Phase



TACOM

- ⇒ Single Customer Approach
- ⇒ Common Acquisition Strategy for UK Project Definition (PD) Phase and US Advanced Technology Demonstration (ATD) Phase
 - Length of Phase
 - Introduction of System Level Demonstration to Address System Risk Early
 - Robust Trade Study Plan and Affordability Decision Process
- ⇒ Common Technical Requirements Specification (TRS) Based on CORD
- ⇒ Common Invitation to Tender (ITT) Document (US Request for Proposal)



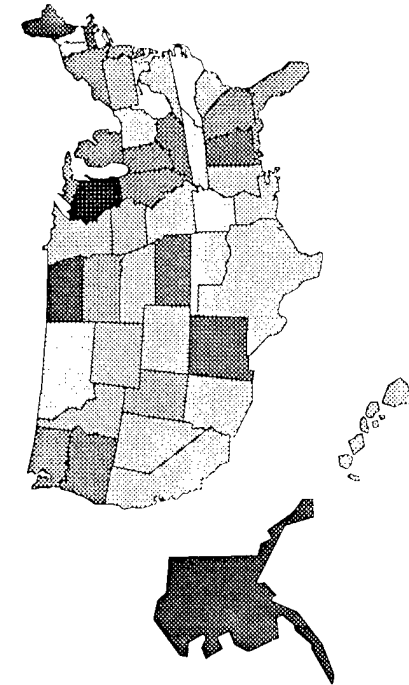


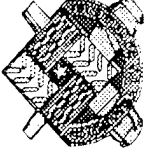
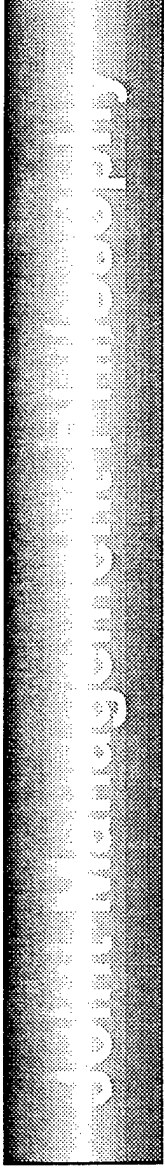
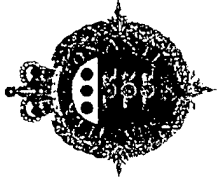
TACOM

Procurement Strategy

Industrial Roles

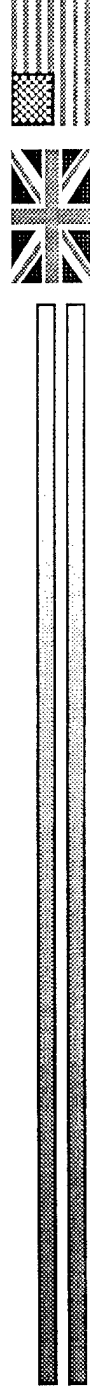
- ⇒ US/UK Partnering Requirement
- ⇒ Work Share
- ⇒ Production Capabilities in Both Nations

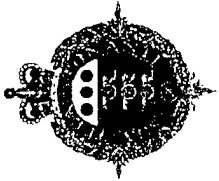




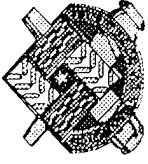
TACOM

- ⇒ Joint Steering Committee (General Officer Level)
- ⇒ Joint Program Office (JPO):
 - Abbey Wood, UK and Warren, MI, US
- ⇒ Exchange of Personnel, Co-located with PMO
- ⇒ US/UK Subject Matter Expert (SME) Teams to Assist Consortia
- ⇒ UK Contracting Agency for PD/ATD
 - All Contracting Documents Harmonized
- ⇒ Best Practices from both Nations being Employed





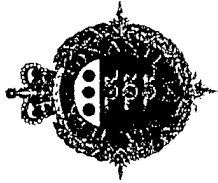
Technology Exchange



TACOM

- ⇒ US & UK Industry Export Licensing Agreements in Place
- ⇒ US & UK Government Technology Program Exchange Meetings with Industry Conducted
- ⇒ Approvals to Include Third Party Country Technologies In Process
- ⇒ Exchange of Developing Government Technology Information will Continue





Potentials for Cooperation Beyond First Phase

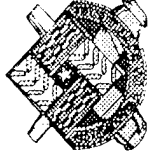
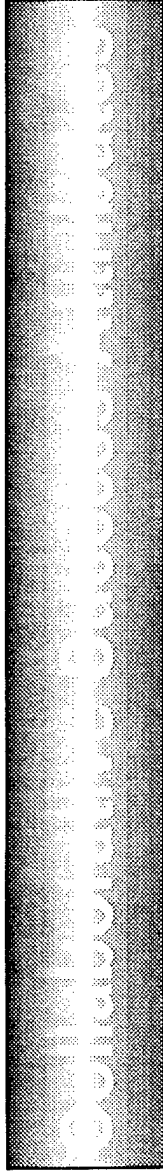
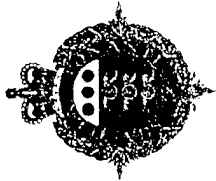


TACOM

- ⇒ US/UK Memorandum of Understanding (MOU) Addresses all Phases of Collaborative Program
 - 50/50 Cost Share for EMD/FD
 - Use & Disclosure of IPR Addresses Entire Program

ational Approvals Required for
try into Each Subsequent Phase

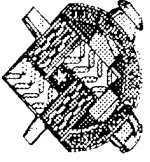
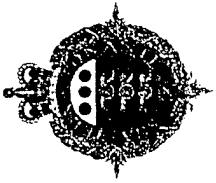




TACOM

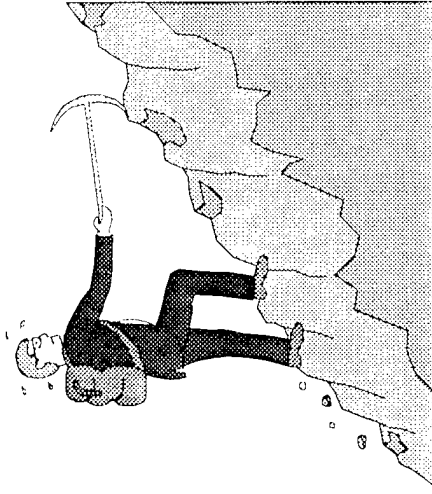
- ⇒ Strong High Level Support from the Outset
- ⇒ Security Addressed from the Outset
- ⇒ Early, Open and Frank Dialogue with Industry
- ⇒ Early MOU Development / Staffing
- ⇒ 50/50 Collaborative Approach
- ⇒ Teamwork and Trust

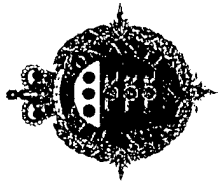




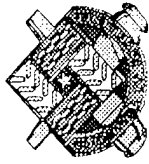
TACOM

Challenges of PD/ATD



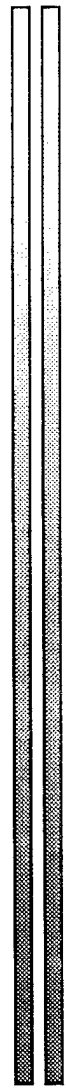
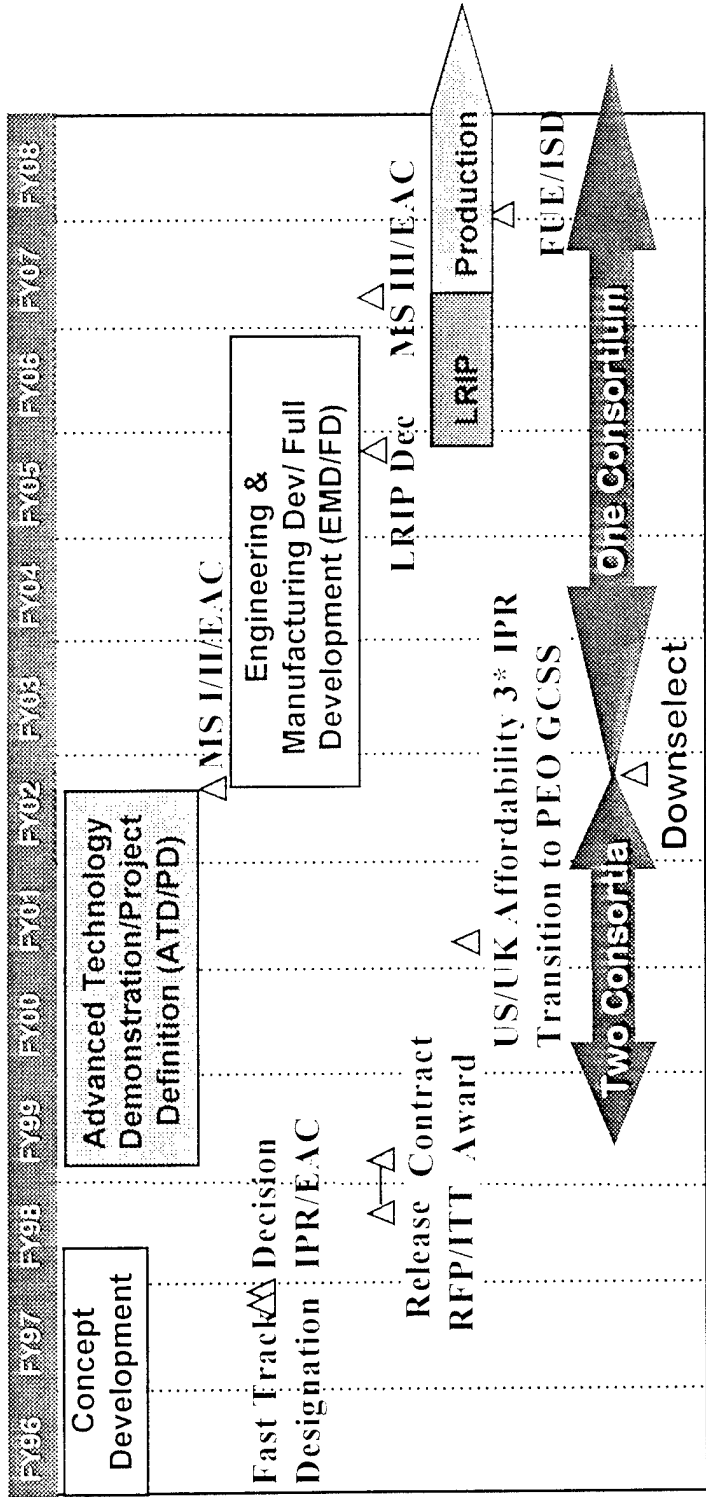


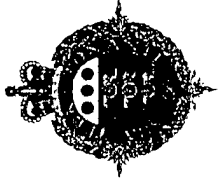
Acquisition Strategy



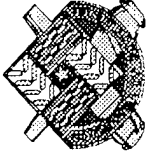
TACOM

TRACER/FSCS PROGRAM SCHEDULE



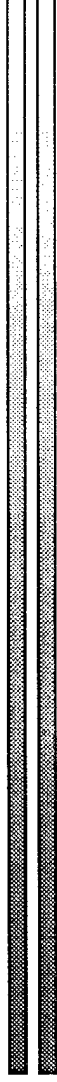
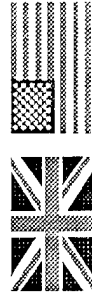


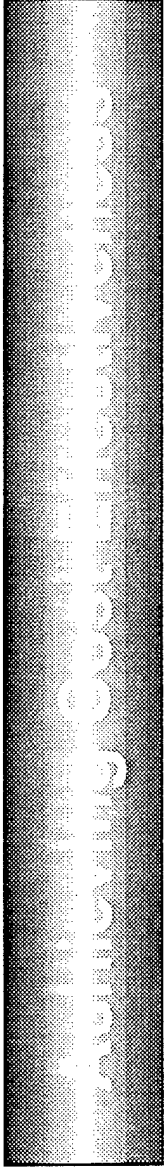
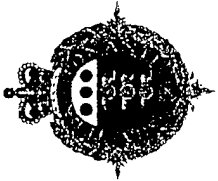
Cost as a primary independent variable



TACOM

- ⇒ Cost will be Examined on Equal Basis with Performance and Schedule in Trade Studies
- ⇒ LCC Parameters Considered throughout Design Process - Best Value Engineering
- ⇒ Mechanism for Parametric Cost Estimates to be Established by Contractor
- ⇒ Supports Cost-Effectiveness Trade Studies

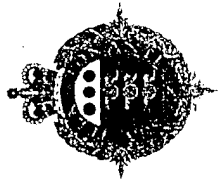




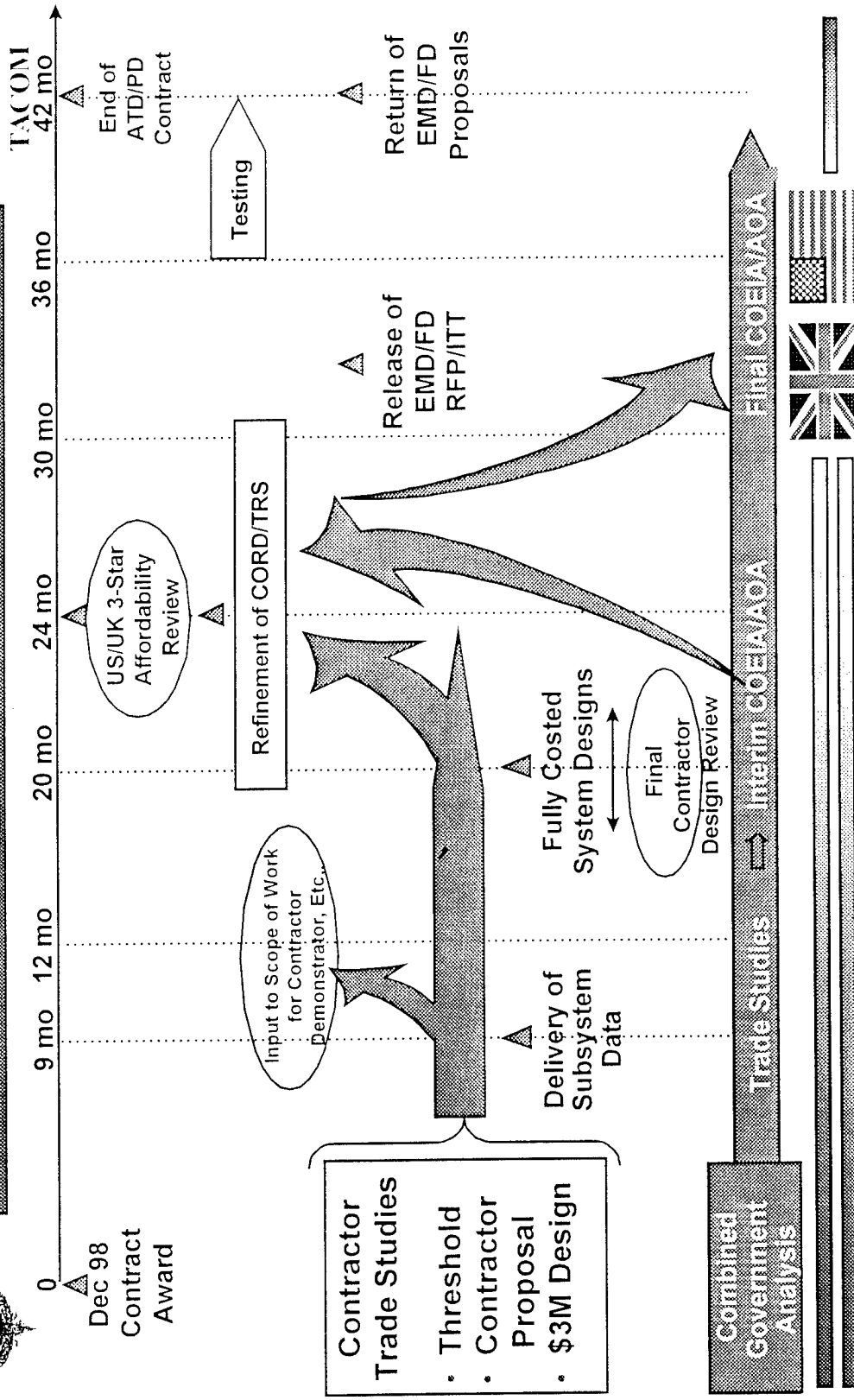
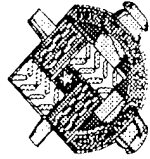
TACOM

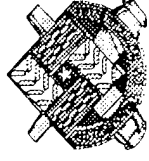
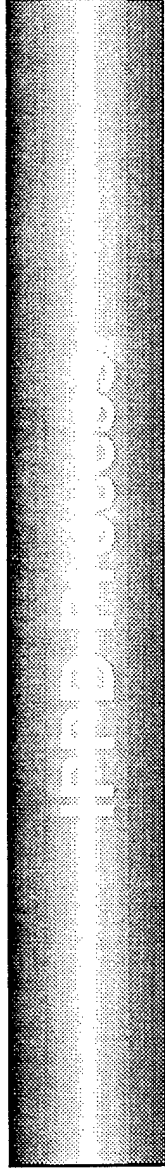
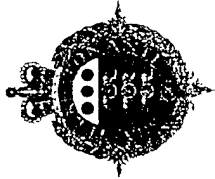
- ⇒ Non-prescriptive Technical Specification
- ⇒ Government Analysis of Trade Study Data
- ⇒ 'Necking-Down' of System Design Options at Month 24 Driven by Cost Effectiveness
- ⇒ Design to Cost Budgetary Estimates for UMC and Whole-Life Support Costs Delivered to Industry





US/UK Joint Military Capability

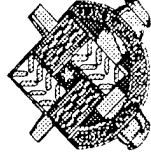
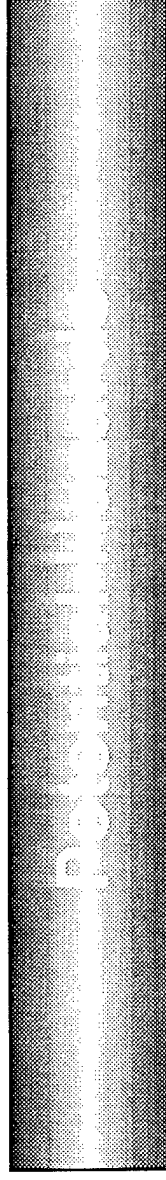
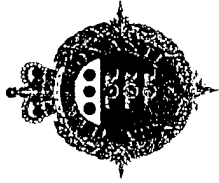




TACOM

- ⇒ Government Personnel Sit on Industry IPTs
- ⇒ Close Visibility of PD/ATD Process to Monitor Progress, Agree Deliverables and Authorize Payment Milestones
- ⇒ Competition must not be Compromised - Strict Control of Individuals to ensure Consistency of Advice

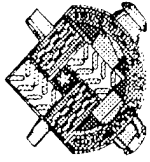
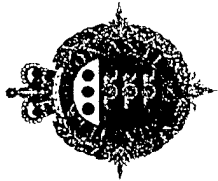




TACOM

- ⇒ National Interest - Especially in Sub-System Selections
- ⇒ Nationally Balanced System Solutions Essential for Cost Share in FD/EMD without Compromising Performance
- ⇒ National Views of Cost Effectiveness and Affordability Could Diverge
- ⇒ Industrial Rationalization
- ⇒ Cost Overhead or Collaboration could Decrease Risk Reduction During ATD/PD Phase

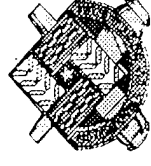
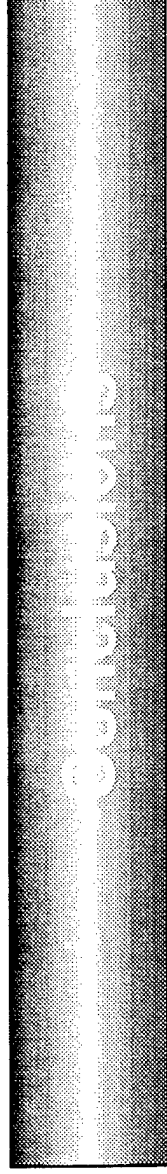
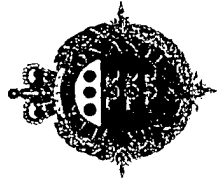




TACOM

Conclusion

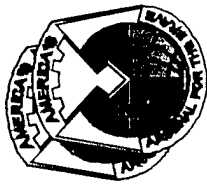




TACOM

- ⇒ Realistically Addresses the Constrained Financial Environment
- ⇒ Leverages Two National Technology Bases
- ⇒ Capitalizes on Two Industrial Bases
- ⇒ Saves Acquisition Dollars and Reduces Overall Cost of System Ownership
- ⇒ Effectively Enables Modernization





LAV PROGRAM UPDATE

COMBAT VEHICLE CONFERENCE
22 SEPTEMBER 1998

Thomas M. Lytle
Colonel, PM, LAV

1/19

Tank-automotive & Armaments Command
Committed to Excellence

TOPICS

- O LAV MARINE CORPS PROGRAMS
- O LAV INTERNATIONAL PROGRAMS

9/22/98

2/19

Committed to Excellence

LAV MARINE CORPS PROGRAMS

9/22/98

3/19

Committed to Excellence

111

LAV SERVICE LIFE EXTENSION PROGRAM (SLEP)

Objectives Assumptions

- | | |
|---|--|
| 1. Extend LAV service life through 2015 | → Resources will allow LAV replacement by 2015 |
| 2. Reverse declining trend of operational readiness | → LAV Auto-hull will remain viable platform through 2015 |
| 3. Reduce Fleet O&S costs | |
| 4. Enhance performance where appropriate and affordable | |

9/22/98

4/19

Committed to Excellence

LAV SLEP

Acquisition Strategy

- Rationale
 - Fleet reaches projected service life 2003-2008
 - Funding not available for replacement vehicle before 2010
- Strategy - The priority of the effort will be to maintain the current capability of the LAV Fleet. Product Improvements and Tech Insertion will be accomplished as enhancement, IF AFFORDABLE, to meet operational deficiencies.

9/22/98

5/19

Committed to Excellence

LAV SLEP

Schedule

| | |
|--------------|--------------|
| →MS 0 | 1 Qtr/FY98 |
| →MS I/II (a) | 2 QTR/FY99 |
| →MS II (b) | 1 QTR/FY00 |
| →DT/OT | 1-4 QTR/FY01 |
| →MS III | 4 QTR/FY01 |
| →IOC | 4 QTR/FY03 |
| →FOC | 1 QTR/FY07 |

9/22/98

6/19

Committed to Excellence

POTENTIAL SLEP Components

| | | |
|--|---|------|
| → General | → Auto-Hull | 7/19 |
| → Corrosion Prevention Program → LAV-25 Battery Box Mod | → Mechanical | |
| → Hull/Structural Crack Reduction | → Steering Bearing Shaft Upgrade | |
| → IETM | → Alternator Bracket | |
| → Integrated Battlefield Info Sys | → Driveline & Suspension Retrofit | |
| | → Engine | |
| → Turret/Gun | → Transmission | |
| → LAV-25 Contact Test Set | → 2-Speed Transfer Case | |
| → Driver's Hatch Upgrade | → Power Pack Maintainability Enhancements | |
| → Gyro Test Kit | | |
| → Gyro Upgrade | → Hydraulic/Pneumatic | |
| → Traverse Drive Backlash Test Kit | → Pneumatic System Air Dryer | |
| → Gunner's Hatch Upgrade | → Hydraulic System Test Kit (Hull) | |
| → Sight Synchronization Kit | → Hydraulic Oil Cooler | |
| → Sight Purging Kit | | |
| → Hydraulic Test Kit (Turret) | → Electrical | |
| → Long-Stroke Recoil Mechanism Upgrade | → Alternator Test Kit | |
| | → Cable Test Kit | |

9/22/98

Committed to Excellence

POTENTIAL

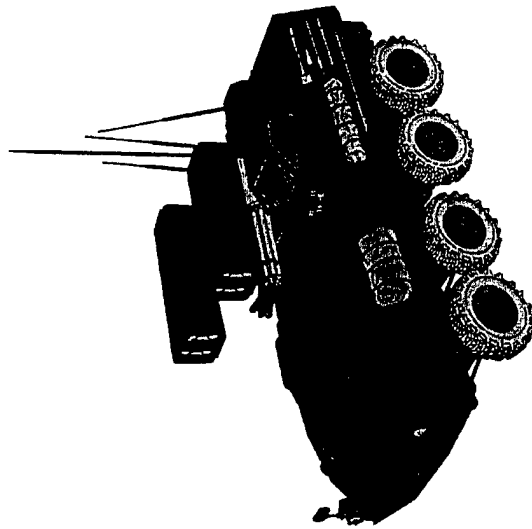
SLEP Enhancements

- Turret/Gun
 - Electric Turret Drive
 - 30mm MG/AAAV Turret
 - LAV-25T & TE TOW Retrofit
 - Gun Control Unit Retrofit Kit
 - Traverse Drive Upgrade Kit
 - Gen II HIRE Sight
 - Gen III Night Elbow Kit
 - Manual Drive Slip Ring Upgrade Kit
 - HIRE Installation Enhancement
- Auto-Hull
 - Mechanical
 - Muffler Signature Enhancements
 - Heavy Duty Torsion Bars
 - LAV II Shocks
 - Wheel and Tire Assembly
 - Cooling System Retrofit
 - Swim Aids
 - Quick Engine Disconnect
 - Marine Drive Mounting Bracket Upgrade
 - Electrical
 - Low Voltage Headlights & Taillights

9/22/98

8/19

Committed to Excellence



LIGHT ARMORED VEHICLE - AIR DEFENSE

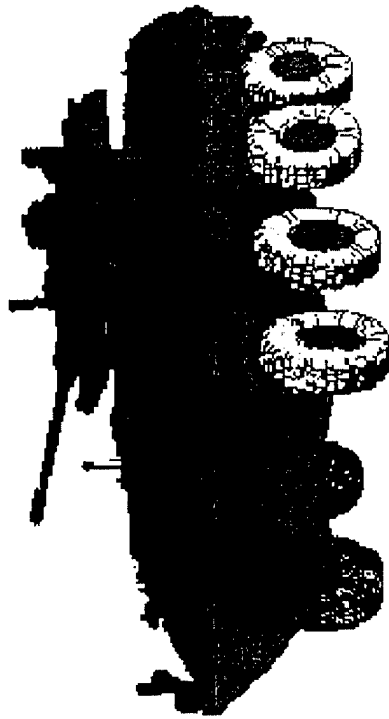
- Crew: 3 (Commander/Gunner/Driver)
- 25mm Gatling gun (Total of 990 rounds)
- Stinger missiles (Total of 16)
- FLIR/Day TV Sight
- Automatic Tracking
- Eye safe Laser Range Finder
- Common LAV chassis
- General Dynamics Ordnance Systems, Burlington, VT (22 Dec 95)
- Quantity: 16 (4th LAR Bn, CamPen)
1 (NSWC Crane, IN)

MILESTONE SCHEDULE

- Engineering devel contract award Dec 87
- DT-II test completed Feb 91
- R&D contract award Jun 92
- MDA directed more testing May 94
- DT/OT -IIB completed Jul 94
- RFP issued Sep 95
- MS-III Decision approval Dec 95
- Contract award Dec 95
- IOC (1st 4 vehicles) Jun 98
- FOC Oct 98

CURRENT STATUS

- Undergoing Initial Production Testing (IPT)
- FOT&E completed 8 Aug; results being analyzed by MCOTEA
- 15 Systems delivered to date (11 shipped-in-place at GDAS being retrofitted - Sight)
- Anticipate completion of IPT and release of vehicles to the 4th LAR in Nov 98
9/19



MOBILITY BLOCK IMPROVEMENT PROGRAM (MB)

- "Silver Series" Engine, with Engine High Idle Kit
- ECP-type Improvement: Brake System Upgrade
 - - Tire Chains
 - - Steering Roller Bearings
 - - Engine Grill Swim Covers
 - - Laser Shielded M17 & M27 Periscopes
 - - Portable Tire Mounter/Demounters
 - - Power Pack Ground Hop Stand
- RDT&E Contracts - Non-competitive, DDC & DDGI
- Prod. Contracts - Non-competitive & competitive

MILESTONE SCHEDULE

MS I/II Decision
 RDT&E Contracts Awarded
 DT/OT Completed
 LAR
 MS-III Decision
 Production Contracts Awarded
 IPT Completed
 IOC
 FOC

Jul 95
 Aug 95
 Dec 95
 May 96
 May 96
 Aug 96
 Apr 97
 Oct 97
 Aug 99

CURRENT STATUS

- o 749 (81%) complete (either installed in LAVs or on the shelf)
- o 791 delivered by DDC
- o Program on schedule for Aug 99 FOC

POC: Mr. Carl Zink; DSN: 786-8369

Comm: (810) 574-8369

E-Mail: zinkc@cc.tacom.army.mil

Date: Sep 98 10/19

OTHER USMC PROGRAM SUPPORT

Joint Light NBC Recon System (JLNBCRS)

- JLNBCRS suite to be integrated into HMMWV & LAV
- 31 basic LAV-L chassis to be provided to integrator as GFE
- PM-LAV handling procurement of basic LAV-L chassis

Mobile Electronic Warfare Support System (MEWSS)

- Joint USMC/USA Program with USA the lead service
- PM-LAV assisting PM-Intel/Comm with MEWSS PIP on auto/hull issues

Applique Armor

- Emerging conflict with weight and coverage requirements
- Potential problem w/storage of solvent and adhesive (HAZMAT)
- Program under review

Enhanced C2 Variant

- Mar 98 - change to LAV ORD
- Apr 98 - IPT met to discuss revised performance requirements
- Leveraging efforts on the AAAV program
- Prototype candidate system to be evaluated during the "Urban Warrior" exercise
- Draft performance specification for comment and release following Urban Warrior

11/19

LAV INTERNATIONAL PROGRAMS

9/22/98

12/19

Committed to Excellence

1.0

ACTIVE PROGRAMS

- SAUDI ARABIAN NATIONAL GUARD (SANG)
- - OTHER POTENTIAL INTEREST
 - - IRELAND
 - ISRAEL
 - TAIWAN
 - SANG (Added battalion)
 - US Army

9/22/98

13/19

Committed to Excellence

121

SANG

PRODUCTION DELIVERIES TO-DATE

| VARIANT | QUANTITIES REQUIRED | QUANTITIES DELIVERED |
|--------------------|------------------------|-------------------------|
| • LAV-25 | 384 | 384 |
| • LAV-Anti Tank | 111 | 111 |
| • LAV-Pers Carrier | 47 | 47 |
| • LAV-Recovery | 67 | 67 |
| • LAV-Comm/Control | 182 | 182 |
| • LAV-Engineer | 34 | 34 |
| • LAV-Ambulance | 71 | 71 |
| • LAV-Mortar | 73 | 4 |
| • LAV-Ammo Carrier | 18 | 0 |
| • LAV-Assault Gun | 130 | 0 |
| • Total Required | 1,117 | |
| • Total Delivered | | 900 |

9/22/98

14/19

Committed to Excellence

SANG 120mm Turreted Mortar

Characteristics

- Based on LAV Type 1 chassis (Marine Corps version)
- 120mm smooth bore, breech loaded Royal Ordnance Mortar weapon
- Mecar HE, WP and Illum ammo (SANG directed source)
- Delco modified Vista fire control computer with English and Arabic capability
- 500-9200m range indirect fire
- 240-1000m direct fire
- -5 to +80 degrees elevation/full 360 deg weapon traverse
- 40 round ammo stowage capability
- Digital link with FDC

15/19

Mortar Planned Program

| | |
|--------------------------------------|-----------------|
| • Weapon/ammo certification | Aug 97 - May 99 |
| • System testing at YPG/NATC | Mar 98 - Sep 99 |
| • Recoil mech/barrel fatigue tests | Mar - Jul 99 |
| • System-level safety tests | Mar - Apr 99 |
| • RAM firing | Mar - May 99 |
| • Performance testing | Mar - May 99 |
| • RAM miles at NATC | Nov 98 - Jan 99 |
| • First production vehicle accepted | May 99 |
| • Deliveries to KSA | Jul 99 - Dec 99 |
| • Mortar/FDC/AC interop test at NATC | Aug-Sep 99 |

9/22/98

16/19

Committed to Excellence

Mortar Planned Program

| | |
|--------------------------------------|-----------------|
| • Weapon/ammo certification | Aug 97 - May 99 |
| • System testing at YPG/NATC | Mar 98 - Sep 99 |
| • Recoil mech/barrel fatigue tests | Mar - Jul 99 |
| • System-level safety tests | Mar - Apr 99 |
| • RAM firing | Mar - May 99 |
| • Performance testing | Mar - May 99 |
| • RAM miles at NATC | Nov 98 - Jan 99 |
| • First production vehicle accepted | May 99 |
| • Deliveries to KSA | Jul 99 - Dec 99 |
| • Mortar/FDC/AC interop test at NATC | Aug-Sep 99 |

9/22/98

16/19

Committed to Excellence

MORTAR CURRENT STATUS

- Testing Program approximately seven months behind schedule
 - late weapon delivery
 - weapon/ammo safety and performance deficiencies
-
- All other program milestones met
 - Test ammo delivery
 - Production chassis delivery
 - Test vehicle delivery
 - Software development
 - Log development

9/22/98

17/19

Committed to Excellence

SANG Assault Gun

Characteristics

- 90mm Main Gun (CMI)
- Two-man Turret
- 28v Electric weapon/turret drive
- Gunner's Thermal/Day Sight with Cmdr Remote
- Commander's Panoramic Day Sight
- Digital Fire Control
- MECAR Unique 90mm Ammo
- Commander Loads Weapons
- LAV Gen II Chassis

9/22/98

18/19

Committed to Excellence

LAV-AG(S)

Milestones to Contract Award

-
- OPM-SANG Review and USASAC/DSAA
Signature of JBP Amendment Offer Oct 98
- SANG Signs Amendment Oct 98
- Case Implemented Nov 98
- Issue Final RFP Nov 98
- Receipt of Contractor's Proposal Feb 99
- SANG Review of Proposal Complete Mar 99
- Contract Award Mar 99
-

22 Sep 98

19/19

Committed to Excellence

VEHICLE
Program Overview

**NDIA 1998 Combat Vehicles
Conference**

“The AAAV Represents the Signature Mission of the United States Marine Corps. A Truly Amphibious Vehicle That Will Replace the Marine Corps’ Aging Current System and Provide the Capability to Maneuver, Combat Loaded, With a Marine Rifle Squad at 20-25 Knots in the Water, and Maneuver Cross Country With Agility and Mobility Equal or Greater Than That of the M1 Tank.

The AAAV Will Virtually Revolutionize Every Facet of Marine Corps Combat Operations. It Is One of the Most Capable All-around Weapon Systems in the World. The Technology to Meet These Requirements Has Been Demonstrated and the Plan to Produce This System Represents the Most Operationally Effective Solution for Meeting Marine Corps Requirements.”

General C. C. Krulak , USMC
Commandant of the Marine Corps

Provide High Speed Transport of Embarked Marine
Infantry From Ships Located Beyond the Horizon to
Inland Objectives

Provide Armor Protected Land Mobility and Direct
Fire Support During Combat Operations

| <u>Parameter</u> | <u>Objective</u> | <u>Threshold</u> |
|--------------------------------------|------------------|------------------|
| High Water Speed Sea State 3 | 25 knots | 20 knots |
| Forward Speed (Hard Surface Road) | 72 kph | 69 kph |
| Armor Protection (MMI/M) | 30/1000 | 14.5/300 |
| Firepower (Range M) | 2000 | 1500 |
| Reliability (MTBCMF) | 95 hours | 70 hours |
| Carrying Capacity | 18 Marines | 17 Marines |

| | |
|-----------------------------------|-----|
| GDLS EMPLOYEES | 150 |
| SUBCONTRACTORS EMPLOYEES | 25 |
| GOVERNMENT PROGRAM OFFICE | 74 |
| (DRPM AAA, DCMC, PCO, ACO, Legal) | |
| TOTAL | 249 |



PDRR Contract Award to GDLS on 13 Jun 96

Facility Ribbon Cutting 9 Sep 96

SECNAV, CMC, Senator Warner, Senator Robb

Government Personnel Arrive 23 Sep 96

System Requirements Review (SRR) Completed Dec 96

Integrated Baseline Review (IBR) Completed Dec 96

System Design Review (SDR) Completed May 97

Preliminary Design Review (Prototype) Completed Dec 97

Critical Design Review (Prototype) Completed Jun 98

AAAV(P) #1

Vehicle Assembly:

Nov 98 - May 99

Hull Check-Out:

Jun 99

Turret Check-Out:

Jun 99

Marry Hull/Turret:

Jul 99

Roll Out

Aug 99

Shake-Down Testing:

Aug 99 - Sep 99

Acceptance Testing:

Oct 99 - Nov 99

AAAV(P) #2 Two Months After #1

AAAV(P) #3 Two Months After #2

Developmental/Live Fire Testing:

Jan 00

EOA:

Jul 00


Milestone II DAB Review:

Dec 00

1



137



Two Man Turret
MK 44 Mod 1 30/40 mm Gun
Ready 60 AP/ 150 HE
Stowed 60 AP/ 150 HE
7.62 Coax
Ready 800
Stowed 1600
Full Solution (M1A2) F/C
Fully Stabilized
2nd Gen FLIR (240x4)
Eye Safe Laser Range Finder
Embedded Training and Diagnostics
Open System Architecture

70% Commonality with M242

Dual Feed

Rate of Fire

Single Shot

5 Round Burst at 200 SPM

200 SPM

Weight - 325 pounds

Dispersion- <0.5 mil

30 X 173mm NATO/GAU-8 Standard

40 mm Growth Capable

Growth built into receiver and feeder

Requires change of barrel and minor feeder changes

Reduced Recoil

Other Enhancements

Sealed Feeder

Stainless Steel Hardware

Phosphate breach, bolt, etc

Mil G 23827B Grease

HEI-T: PBXN-5/ M758 SD Fuze

SAPHEI-T

TP-T

APFSDS-T: FCT currently approved for
FY-99

Mauser-Oerlikon Candidate

Raufoss Candidate

Performance

Armor Piercing

30mm AP Significantly Overmatches Target of Interest

25mm at 500m = 30mm at 1500m = 35mm at 2500m

High Explosive

Twice Lethal Area of 25mm

Significantly Better Against Material Targets (BTR/Watercraft)

Substantial Growth For Airburst

Super 40mm Growth

Weight

Larger Medium Caliber Guns Exceeded Weight
And Volume Budgets

20 Year Life Cycle Costs

25mm - \$596.95M

30mm - \$662.92M

35mm - \$1.206B

Balanced Solution

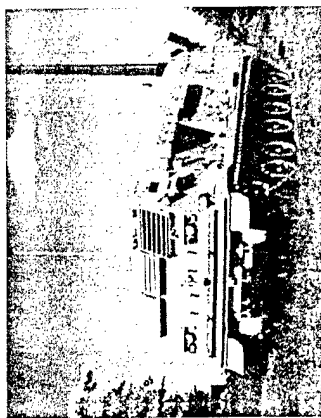
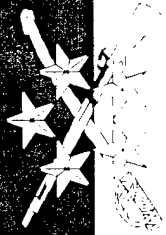
Http://www.aaav.hqi.usmc.mil

PEO

Bradley Fighting Vehicle Systems

Bradley Fighting Vehicle

Program Challenges



COL Paul S. Izzo

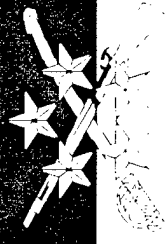
*Project Manager, Bradley Fighting Vehicle Systems
NDIA Combat Vehicle Conference*

Sept 1998

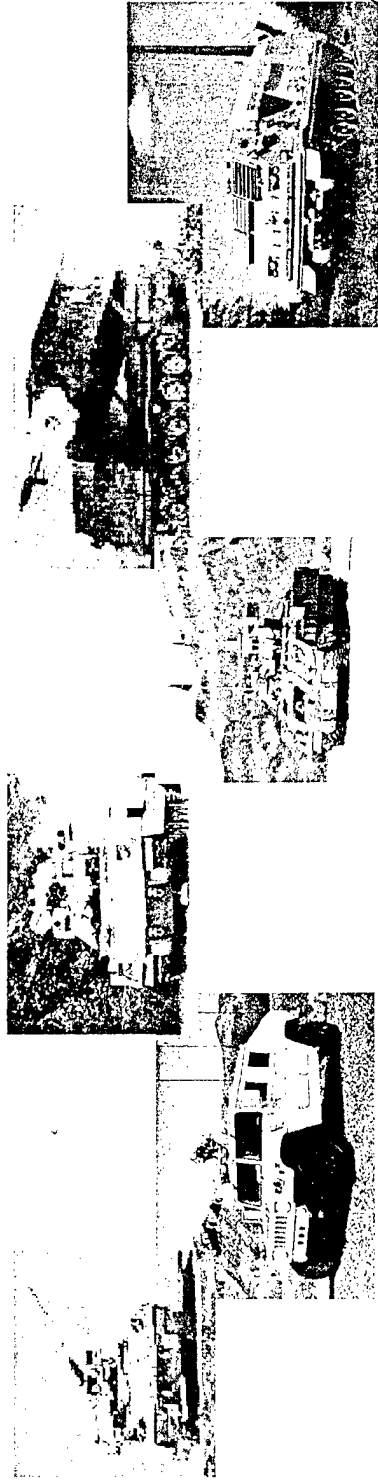




Bradley Fighting Vehicle Program Challenges

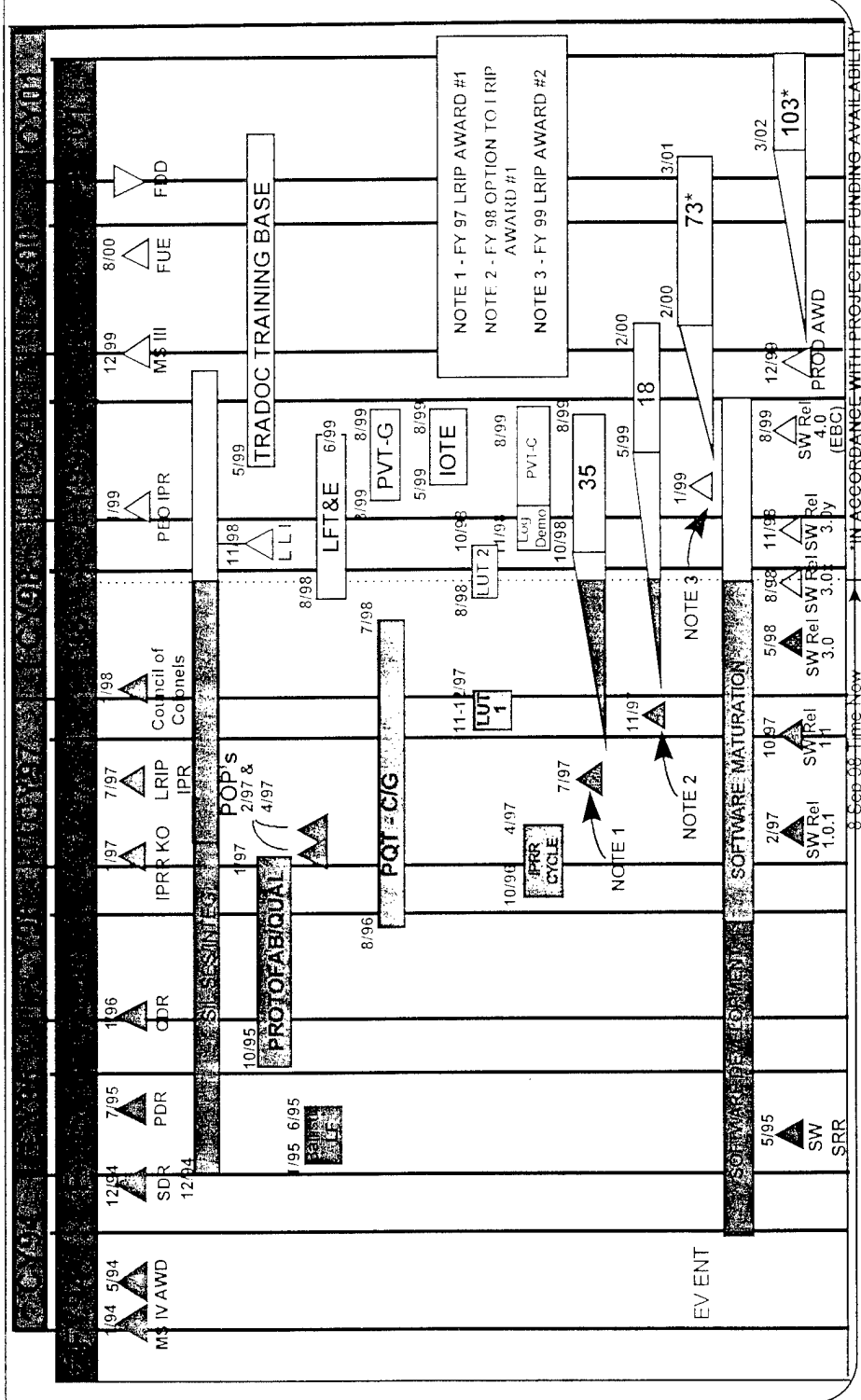


- *Bradley A3 Program Schedule and EMI*
- *Multi-Year/Multi-Product Contract*
- *Reducing Operations & Sustainment Costs*
- *Test, Measurement and Diagnostic Equipment*
-





Bradley A3 EMD Schedule



A3EMD

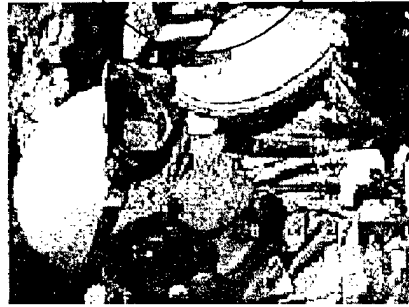


GCSS

Challenge: Managing Electro-Magnetic Interference within Bradley Vehicles

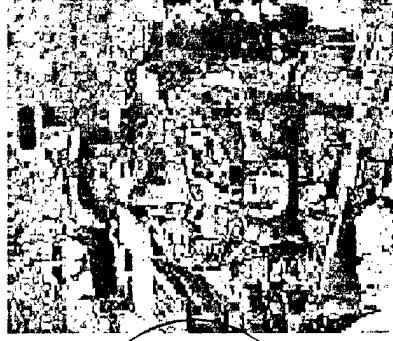


- As vehicles add digital components, complex electronics and radios emit more signal interference in the turret
 - Increased interference in FLIR sights and static in intercom systems
- Status: Root Causes identified with Near Term Fixes
 - Improved Combat Vehicle Crew Helmet reduces interference
 - Improved Antenna base Grounding reduces EMI within turret
 - Studying FLIR impacts to identify EMI entries and shielding options



Army issue:

as systems add even more complex new electronics, need a higher level of system integration to minimize EMI interference





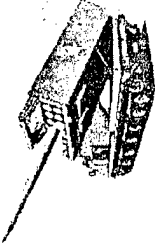
Challenge: Award Affordable BFV Multi-Year/Multi-Product Contract



A3



C2V



MLRS

The Challenge:

- Award Affordable Multi-Year Contract Within FY00-03 POM Dollars
- Award an Omnibus Contract for all UDLP Systems to Facilitate Single Process Initiatives Across all Product Lines
- MY/MP Contract Award Targeted for Dec 99
 - Alpha Contracting
 - Acquisition Streamlining
 - Performance Based Contracting
 - Partnering With Industry Including Subcontracting

Identified Savings Already Removed From Core Programs



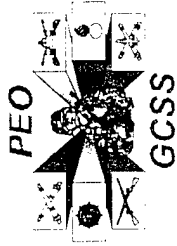
Top 10 BFVS O&S Cost Drivers



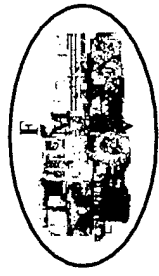
| Rank | NSN | Part Number | Item Name | Approximate Unit Price | Cost / Mile |
|------|------------------|-------------|--|------------------------|-------------|
| 1 | 1240-01-216-6331 | 12293339-1 | Integrated Sight Unit (ISU) T2SS | \$136,949.00 | \$4.61 |
| 2 | 2520-01-338-2703 | 57K0709 | TEC Transmission | \$174,250.00 | \$3.69 |
| 3 | 2530-01-288-2719 | 12359466-1 | Big Foot Track Shoe | \$ 135.00 | \$3.36 |
| 4 | 6110-01-176-8802 | 12328964 | Turret Distribution Box (TDB) | \$ 19,819.00 | \$1.30 |
| 5 | 1240-01-339-6326 | 13294692 | TOW Visual Module Assembly (TVM) | \$ 22,671.00 | \$1.25 |
| 6 | 1005-01-105-5191 | 12524100 | 25mm Gun Feeders | \$ 25,155.00 | \$1.10 |
| 7 | 6110-01-201-7880 | 12328513 | Vehicle Distribution Box (VDB) | \$ 7,568.00 | \$1.03 |
| 8 | 2815-01-290-1290 | 57K0394 | Engine | \$ 48,803.00 | \$0.92 |
| 9 | 2540-01-312-4730 | 12369308 | Shock Absorber | \$ 448.00 | \$0.47 |
| 10 | 1005-01-273-5946 | 9379400 | Digital Electronic Control Assembly (DECA) | \$ 33,042.00 | \$0.45 |

Note: Based on 2200 Vehicles in use, at 650 Average Miles per Year. Current AMDF Prices





PM – MEDIUM TACTICAL VEHICLES 1998 ARMOR CONFERENCE



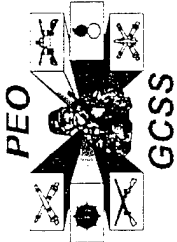
LEADING THE TACTICAL FLEET



COL KENNETH R. DOBECK
PM, Medium Tactical Vehicles

PM-MTV

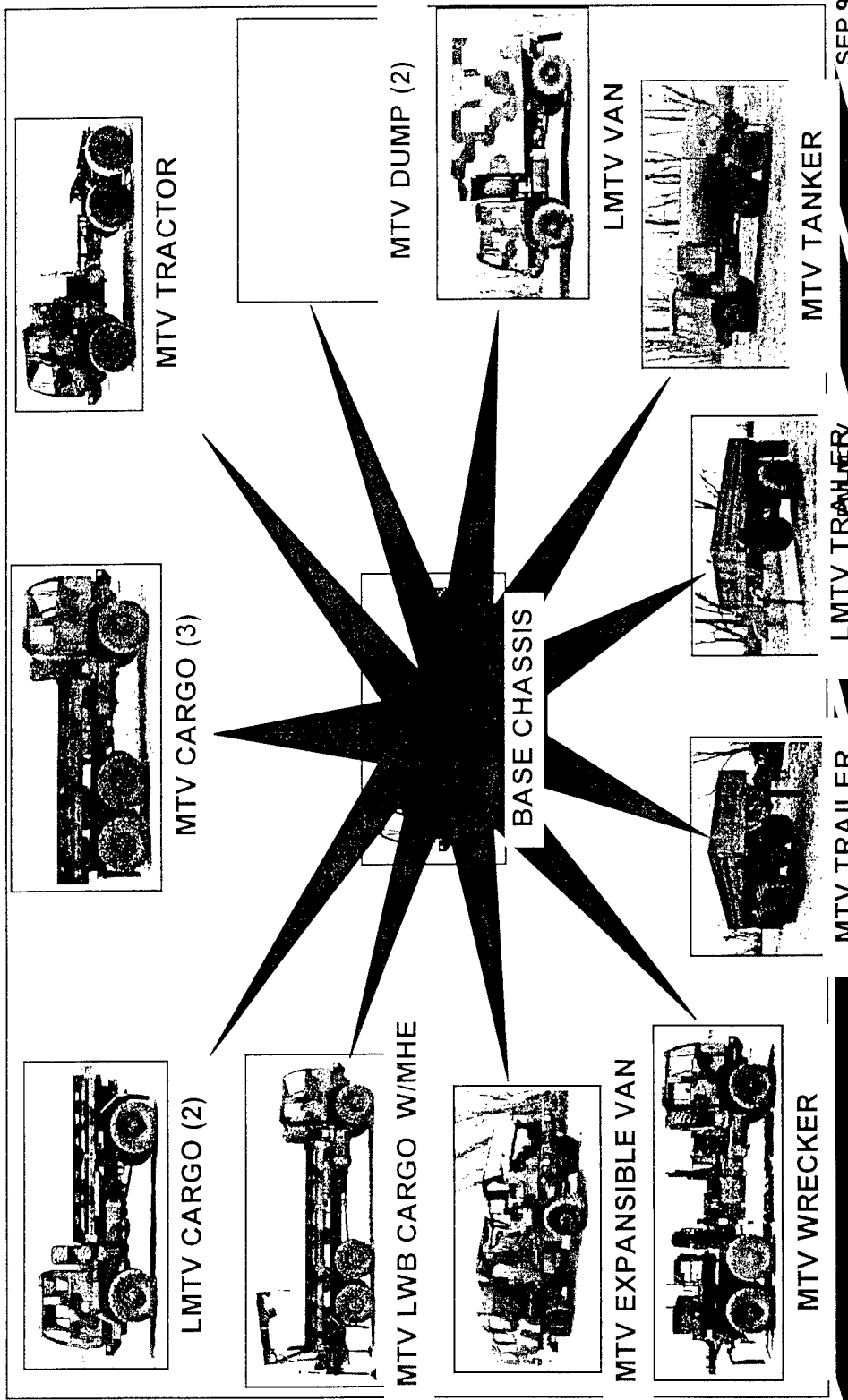
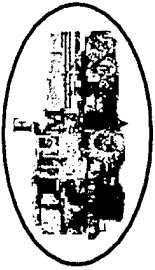
SEP 98

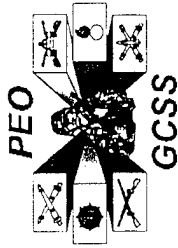


PM - MEDIUM TACTICAL VEHICLES

Family of Medium Tactical Vehicles

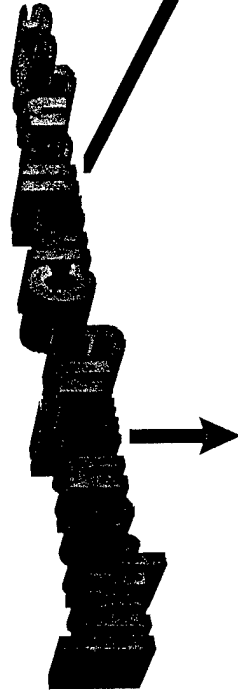
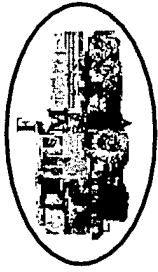
Model Variants





PM – MEDIUM TACTICAL VEHICLES

Leading the Tactical Fleet



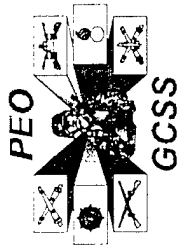
Corrosion Prevention

Common Components

Technical Accomplishments

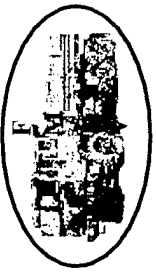
PM-MTV

SEP 98

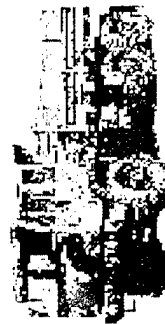


PM – MEDIUM TACTICAL VEHICLES

Common Components



World-wide AAO of 85,000 2-1/2 Ton & 5 Tons
Shortly will add 2 more 5 Ton variants
& trailers at both sizes



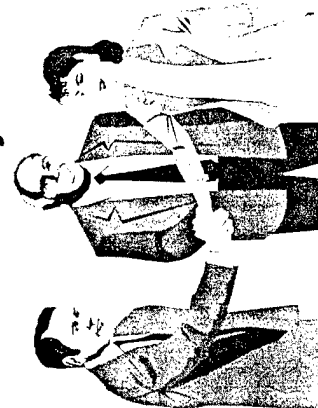
Fielded 5 2-1/2 Ton & 15 5 Ton variants.

Cross country mobility & RAM superior to

commercial 2-1/2 Ton or higher capacity vehicles.

About 85% parts commonality across the entire fleet.

Major components from recognized world-class suppliers ...



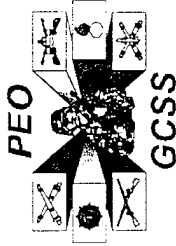
CTIS → Eaton

Tires → Michelin & Goodyear

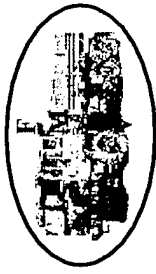
Engine → Caterpillar

Transmission → Allison

Axles/driveshafts → Meritor (Rockwell)



PM – MEDIUM TACTICAL VEHICLES



Corrosion Prevention Initiatives



Over 30 component prevention design upgrades

| | |
|--------------------------------|--------------------------------|
| Full galvanized cab | Brass radiator tanks w/ coated |
| Cab bottom protection | core fins & bottom protection |
| Stainless steel exhaust system | Stainless steel charge air |
| Coated oil pan | cooler tubes |
| Coated transmission oil cooler | Aluminum surge tank |



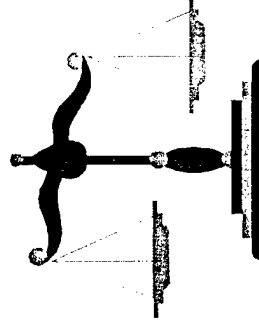
Upgrades enhance life by an additional 10-15 years



Further upgrades planned as technology makes them cost effective to field



Carwell Rust Preventative:



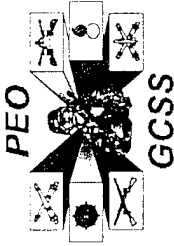
With Carwell:

**\$400 / vehicle to
protect against rust**

Without Carwell:

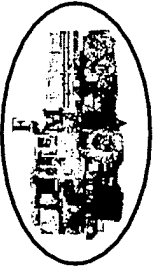
**\$19k / vehicle to
repair rusty eqmt**

(Use for highly corrosive environments)

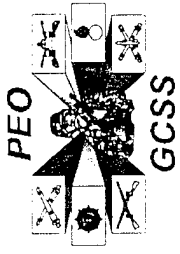


PM – MEDIUM TACTICAL VEHICLES

Accelerated Corrosion Test



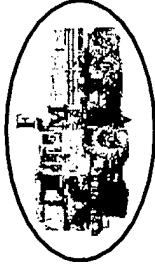
- ✓ Test facility built at Aberdeen Test Center, MD
- 1st of it's kind in Department of Defense!
- ✓ Test design assisted by General Motors & Ocean City Research Corporation
- ✓ Non-Destructive Test evaluations:
 - at both "10 year" & "15 year" points
- ✓ Destructive evaluation at end of test, representing "22 years" of corrosion
- ✓ Future enhancements based on end of test evaluation



PM – MEDIUM TACTICAL VEHICLES

Interactive Electronic

Technical Manuals



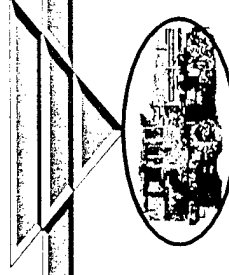
FILES

Sport

EMS2

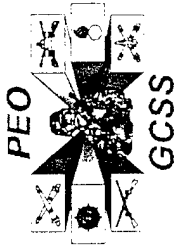
Litton

Beta Test Site

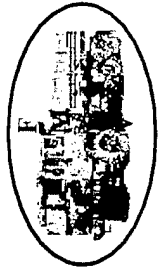


PM-MTV

SEP 98

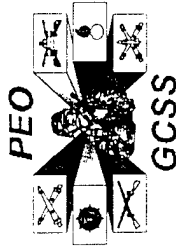


PM – MEDIUM TACTICAL VEHICLES



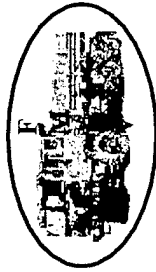
IETM Benefits



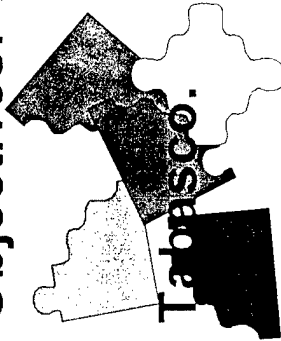


PM – MEDIUM TACTICAL VEHICLES

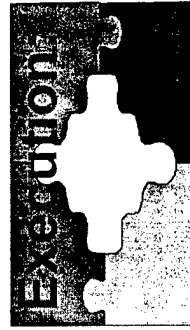
Fleet Management Challenges



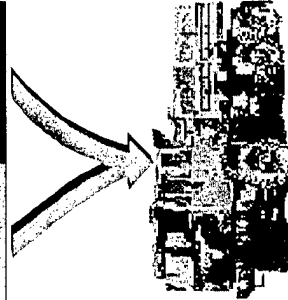
Objectives: Achieve a high degree of readiness.
Assist field units in expediting parts.
Stir creative juices, but hold the



Make Life Cycle Project Management a reality, not a buzzword.

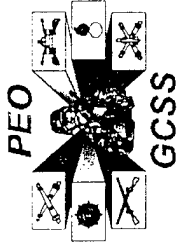


Currently making periodic visits to field sites, discuss & resolve problems.
Tracking & expediting repair of NMCs.
Permanent FMTs at major fielding sites.
Corporate contract initiated to cut parts costs & time for delivery.
For Rebuy contract, will be providing a



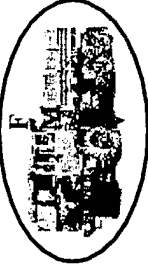
~~PM warranty including parts~~

SEP 98



PM – MEDIUM TACTICAL VEHICLES

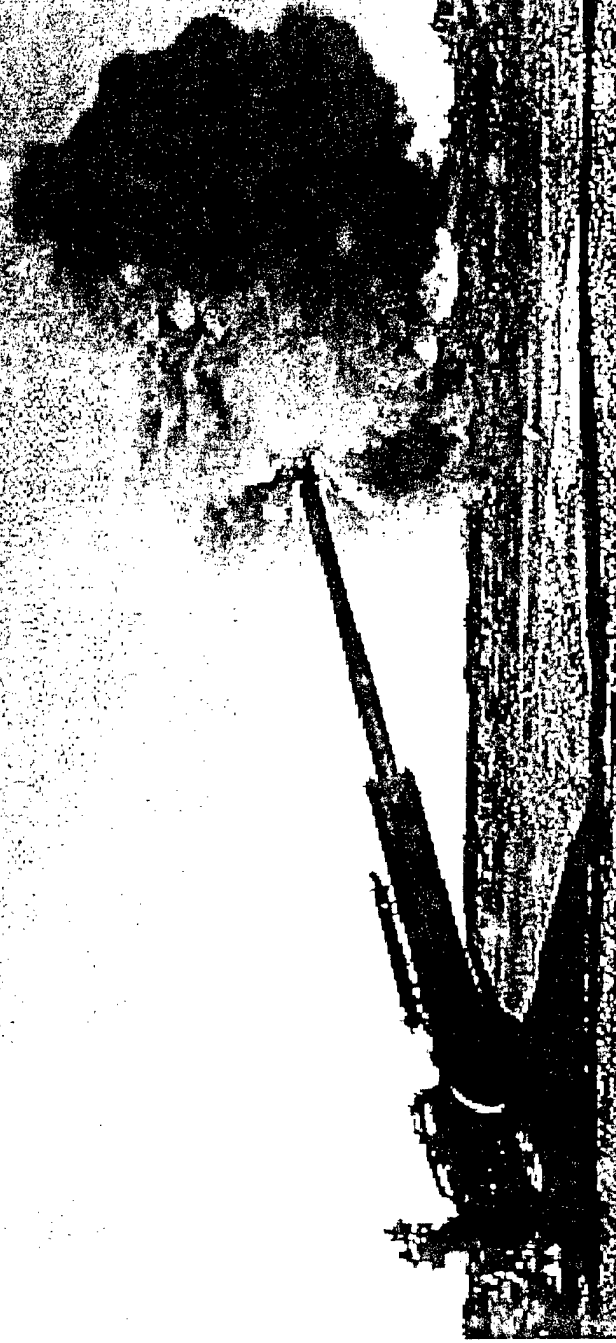
Summary



- ✓ PM-MTV is committed to continuous product improvement and acquisition reform as witnessed by accomplishments and taking on challenges.
- ✓ FMTV is a tactical “force multiplier” for Force XXI and the Army After Next and will provide same, well into the 21st Century.
 -
- ✓ Effective project management of Life Cycle Cost and field logistics impacts are critical to the FMTV program in this continuing age of Cost As an Independent Variable.

Lightweight 155mm Howitzer

21st Century Light Forces Fire Support

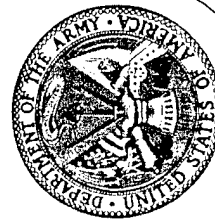


Presented to
1998 Combat Vehicles Conference
NDA



The Marines and Army Have a Fully-Coordinated Effort in Place for Joint Development of LW155

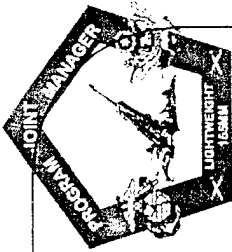
- Assistant Secretary of the Navy (Research, Development and Acquisition) is the Milestone Decision Authority (MDA)
- Commander, Marine Corps Sys Command Directs Program
- PEO-GCSS (Army Executive Agent) Executes Program
- Program Office is JOINT
 - » Marine PM Manages All LW155 Programs
 - » Howitzer Development - USMC Funds & Directs
 - » P3I DFCS Development - USA Funds & Directs
- JOINT Documents:



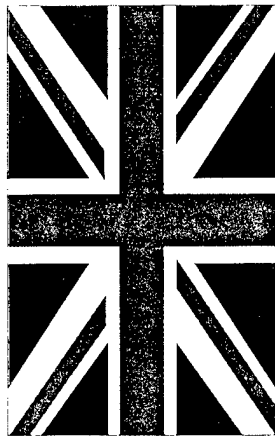
» MNS, JORD, COFEA, ILSP, APBA, and TEMP

The Future of Combined Artillery

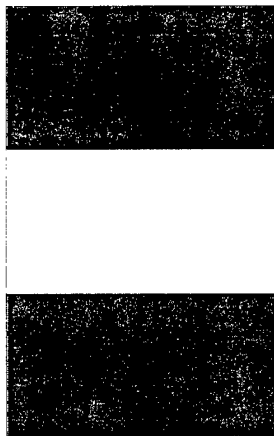
10-



International Involvement



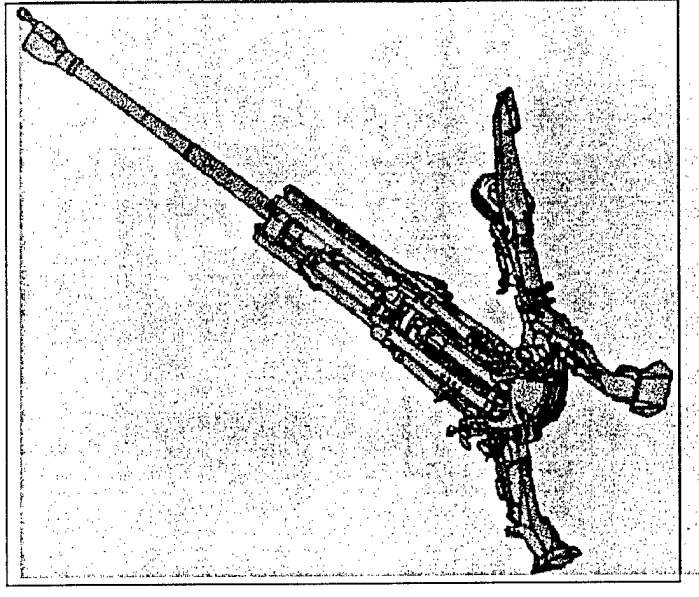
- Bilateral EMD MOU - Sept 98
- Funding to US - Oct 98
- Supplementary Testing Planned
- Integrate UK into the Team - Engineer Already in Place
- UK LIMAWS Study - LW155 the System of Choice



- Trilateral EMD MOU Negotiations Underway
- Funding to US Planned
- Major Support in Auto-Rammer Development
- Integrate Italy into the Team

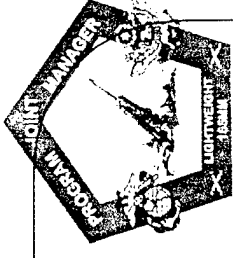
LW155 Joint Operational Requirements Document

- 9000 Lbs or Less - Deployable and Mobile
- Emplace in 2-3 Min, Displace in 1-2 Min
- External Lift by MV-22, CH53D/E, CH47
- All USAF (2 per C130, LW155 & Truck in C141)
- Rate of Fire 5-8 RPM, Sustained 2 RPM
- Max Range 30-40km with Rocket Assist
- Bold Shift in 2-3 Min
- Semi-Auto Breech & Primer Feed Mechanism
- 800 to 900 Rds Between Systems Abort
- P3I: Digital Fire Control System (DFCS)
 - » Digital Indirect Fire Control
 - » Inertial Navigation with GPS Backup
 - » 1st Round Hit Direct Fire Sight
 - » Powered Rammer
 - » Powered Elevation & Deflection Drives
 - » P3I DFCS Weight: 500 Lbs Max



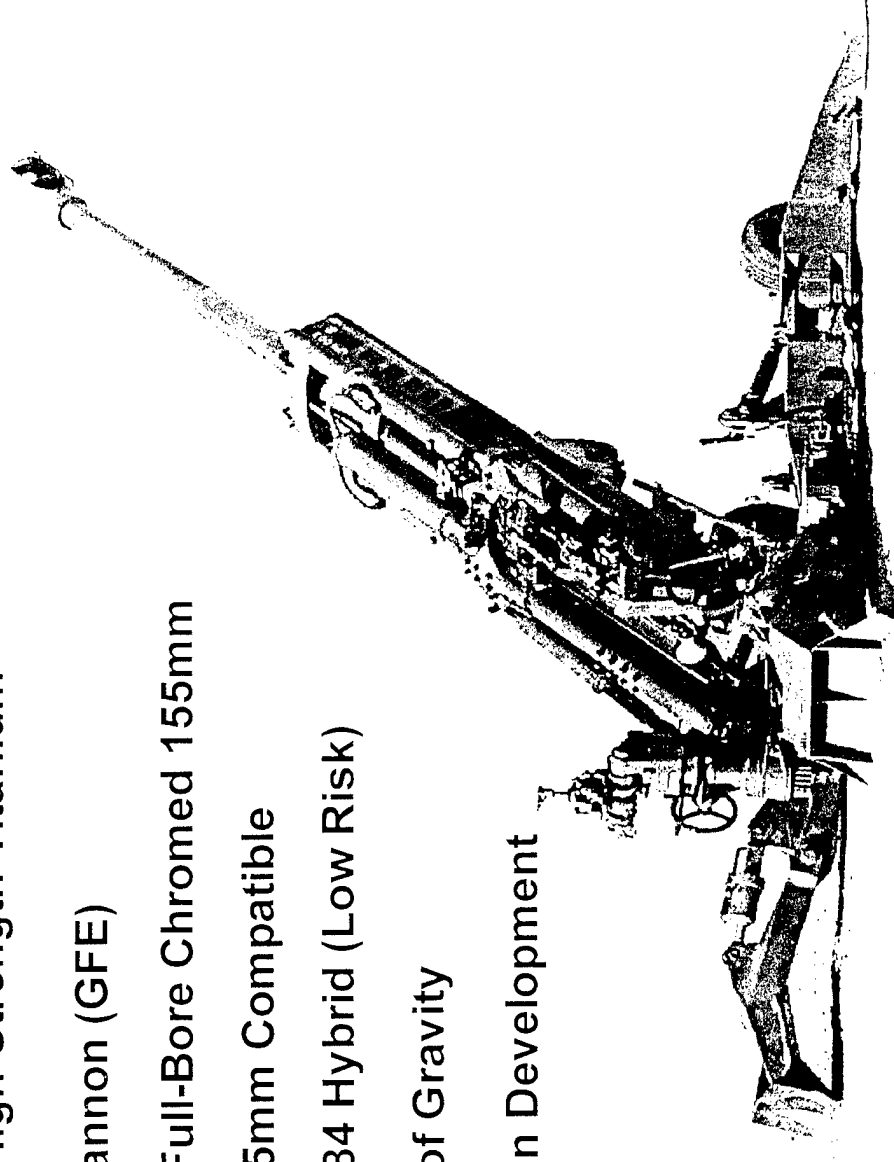
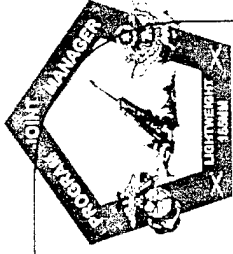
(Signed 29 SEP
95)

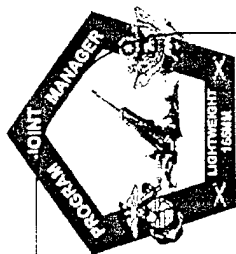
The Future of Towed Cannon Artillery



LW155 Design

- Lightweight High-Strength Titanium
- Watervliet Cannon (GFE)
 - » First US Full-Bore Chromed 155mm
 - » NATO 155mm Compatible
 - » M199/M284 Hybrid (Low Risk)
- Low Center of Gravity
- Eight Years in Development





Fully Coordinated
Howitzer Development Process

FY 94 95 96 97 98 99 00 01 02 03...

The Howitzer Program



3rd Generation

Army EMD

2nd Generation

RFPI AH

1st Generation



The P3I DFCS Program

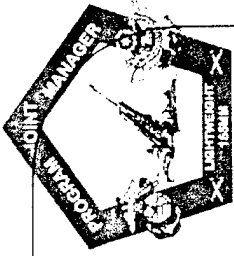
Experiment/Learn

Experiment/Learn

The Future of Towed Cannon Artillery

Fully Coordinated

Marine Army Development



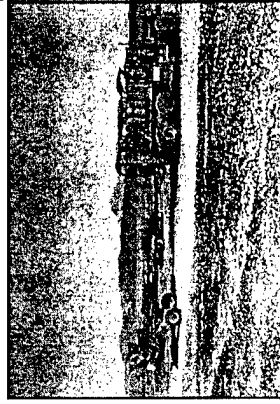
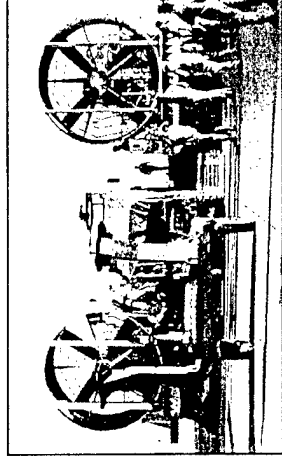
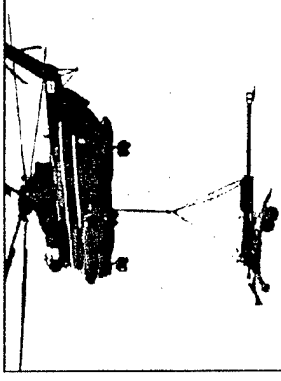
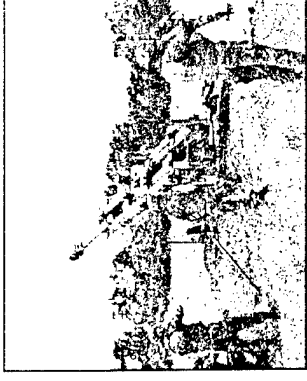
| Activity | FY95 | FY96 | FY97 | FY98 | FY99 | FY00 | FY01 | FY02 | FY03 | FY04 | FY05 | FY06 | FY07 | FY08 |
|------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| LW155 Milestone 0 | ◆ | | | | | | | | | | | | | |
| LW155 Milestone I/II | | ◆ | | | | | | | | | | | | |
| Shoot-off | | ▲ | | | | | | | | | | | | |
| LW155 EMD Phase | | | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| Milestone III | | | | | | | ◆ | ◆ | | | | | | |
| USMC Production | | | | | | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| RFPI DEM/VAL -155 AH | | | | | | ▲ | | | | | | | | |
| Unit Training - 155 AH | | | | ▲ | ▲ | | | | | | | | | |
| RFPI Field Experiment | | | | ▲ | | | | | | | | | | |
| Extended User Eval | | | | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| P3I Contract Actions | | | | | | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| EMD Phase | | | | | | | | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| P3I Milestone III | | | | | | | | ◆ | ◆ | | | | | |
| Army Production | | | | | | | | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |

The Future of Towed Cannon Artillery

11

Engineering and Manufacturing Development

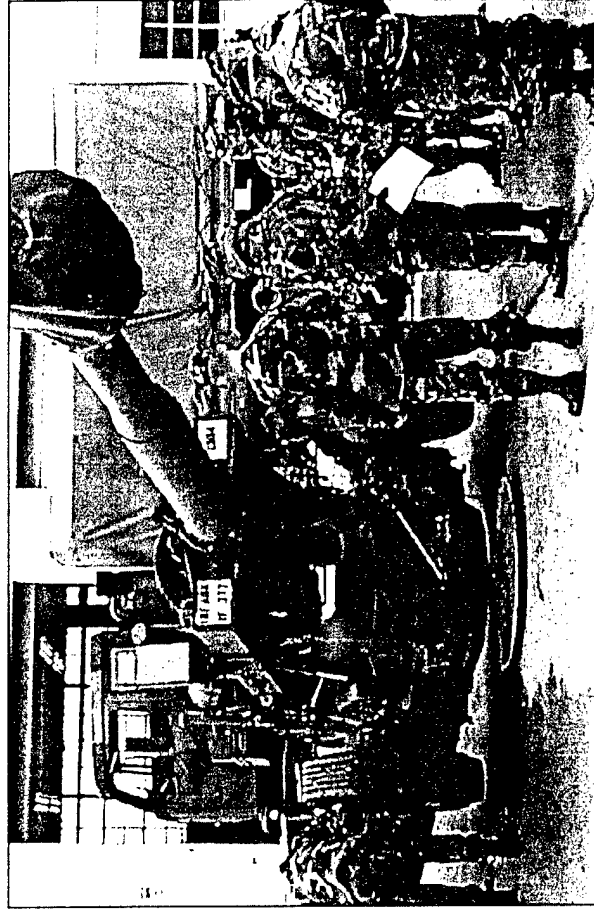
- Applied Shoot-Off Lessons Learned
- Comprehensive Evaluation of 8 EMD Prototypes
- Arctic, Jungle and Desert



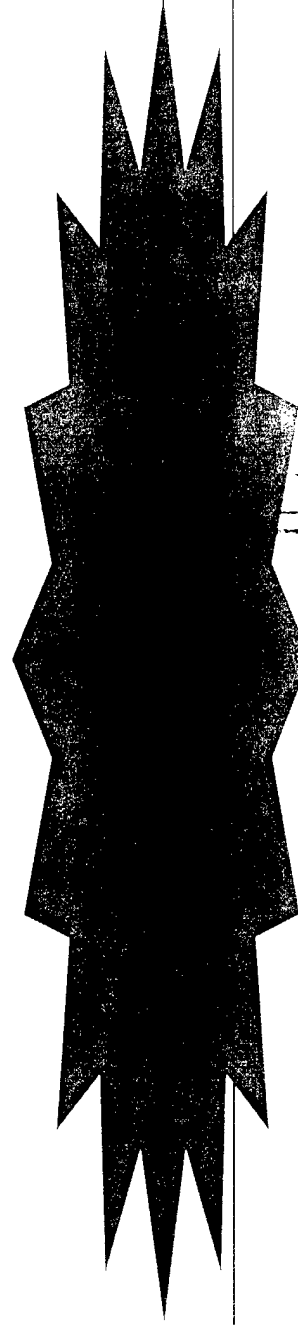
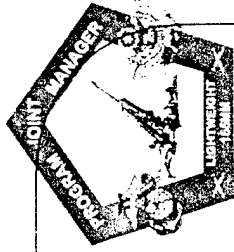
- Joint Marine & Army Live Fire Tests
- Detailed Logistics & Fielding Plans
- Production Preparation & Decision

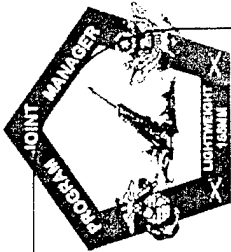
11

Rapid Forces Projection Initiative

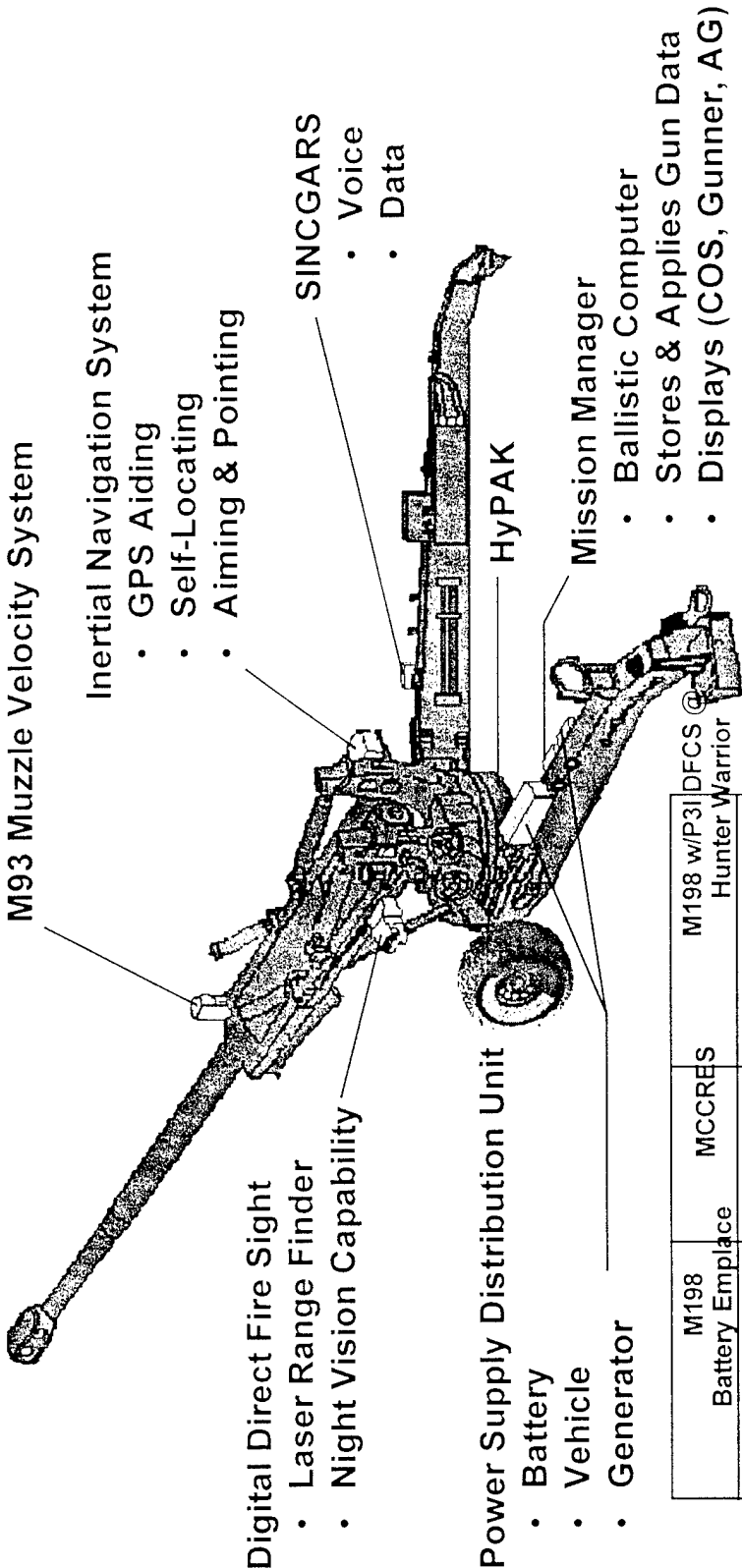


March 98 - Soldiers of the XVIII Airborne Corps Artillery
Training on RFPI Automated Howitzer





Digital Fire Control Technology Demonstrator

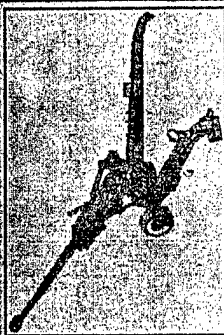


| M198 | MCCRES | M198 w/P31 Hunter Warrior |
|-----------------|--------|---------------------------|
| Battery Emplace | 12 Min | 3.5 Min |
| Day | 20 Min | 3.5 Min |
| Night | | |

The Future of Towed Cannon Artillery

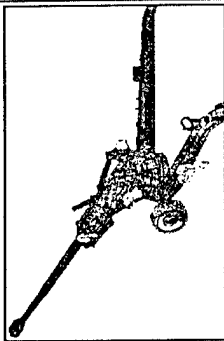
155mm Towed Artillery Digitization

GENERATION 1



Army & USMC AWEs

GENERATION 2



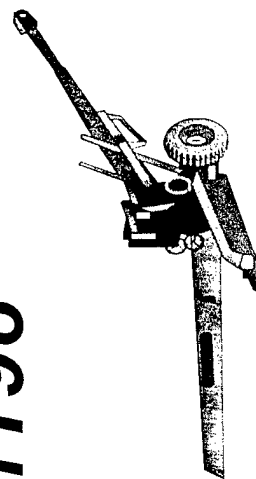
Army RFPI (155 AH)

Technical/Operational
Lessons Learned

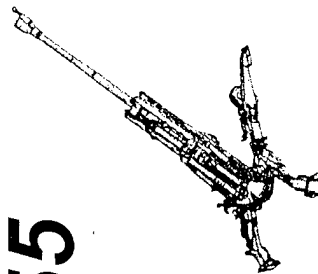
EMD / Production

GENERATION 3

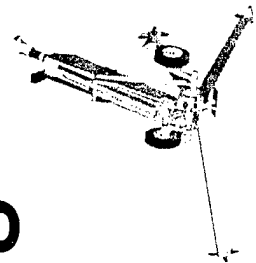
M198



LW155

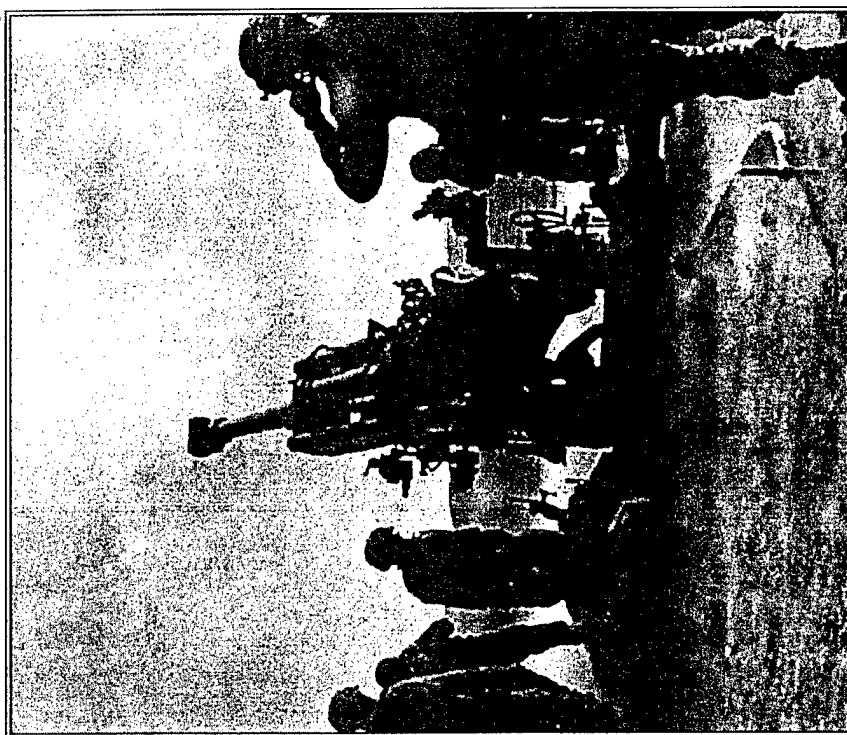


ATLAS

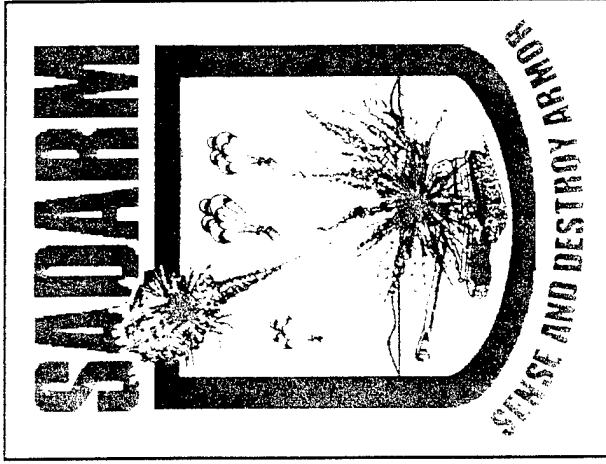




Summary



- Fast Moving Joint Program
- Valid Joint Requirements
- Strong Support
- International Involvement
- On Track for 2002 USMC IOC



OPM SADARM

Briefing

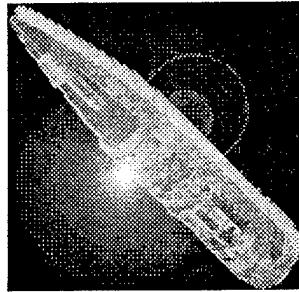
23 September 1998

Presented To:

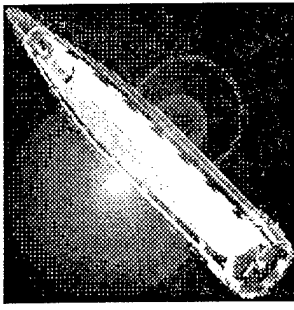
1998 COMBAT VEHICLES CONFERENCE
MOUNTED FORCE MODERIZATION PANEL

Presented By:

MR. JOSEPH GORMLEY
Business Manager, PM SADARM
(973) 724-5891

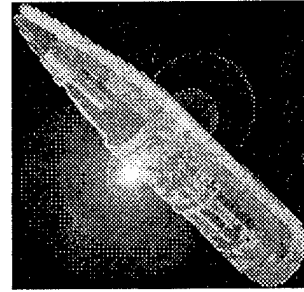


M898
SADARM

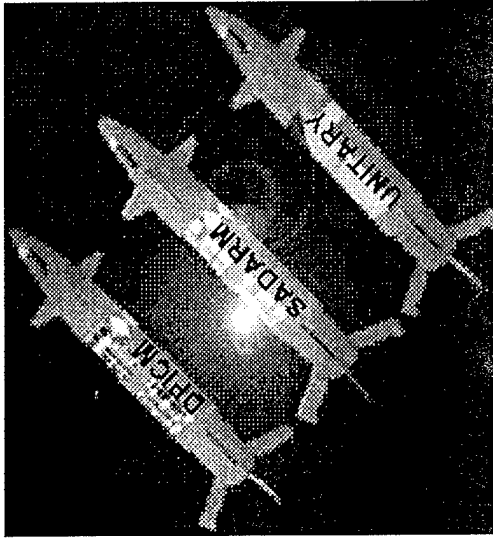


M795
High Explosive

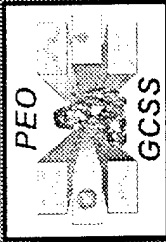
Deliver *Leap - Ahead* *Munitions Combat* *Power* *to* *War Fighters*



M898E1
PI SADARM



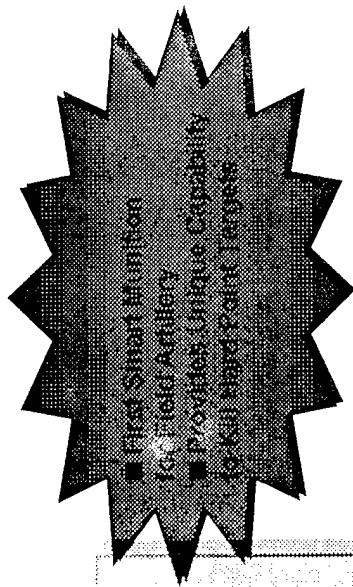
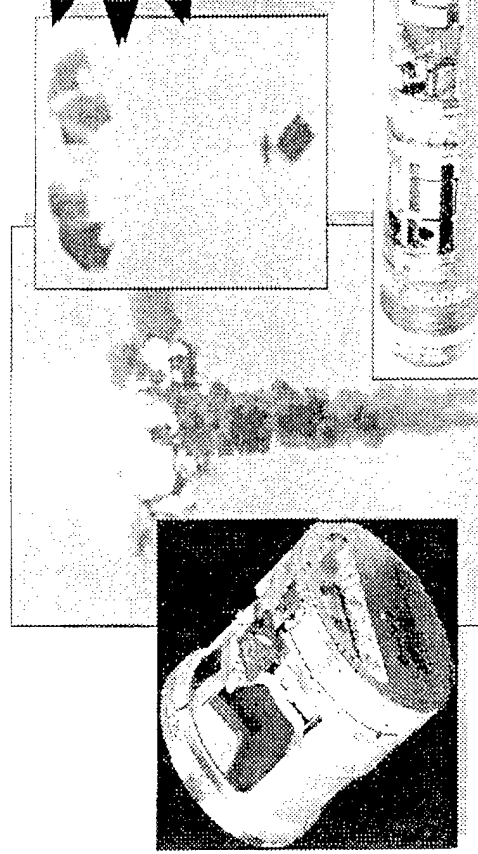
XM982
Extended Range
Artillery Projectile



What Is SADARM?

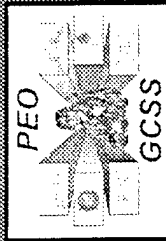


What Is SADARM?

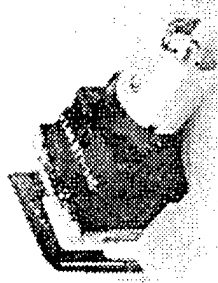


- Multi-Sensor, Fire & Forget, Top Attack
 - Counterbattery Weapon, Secondary Anti-Armor
 - Countermeasure Resistant
 - Explosively Formed Penetrator Defeats All Known Armored Targets From Top

M898

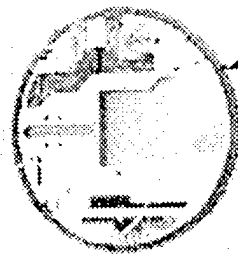


Multi-Mode Sensor Suite: Countermeasure Robustness



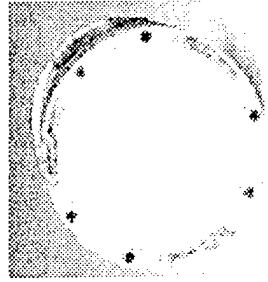
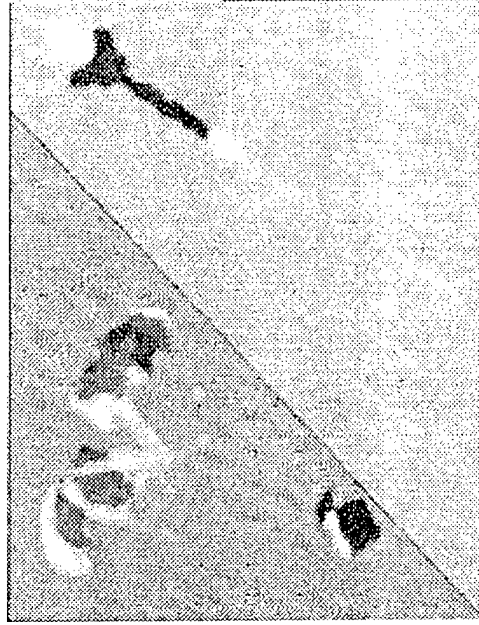
Passive IR

- Heat Sources
- Full Image of Target
- Preferred Aiming Sensor
- Flare/Fire Discrimination



Magnetometer

- Orientation
- Spin Rate Count



MMW

Passive

- Metallic Object Sensing
- Scene Sensing
- Tactical Target Sizing
- Aimpoint Puller Discrimination
- Combined Countermeasure Discrimination

Active

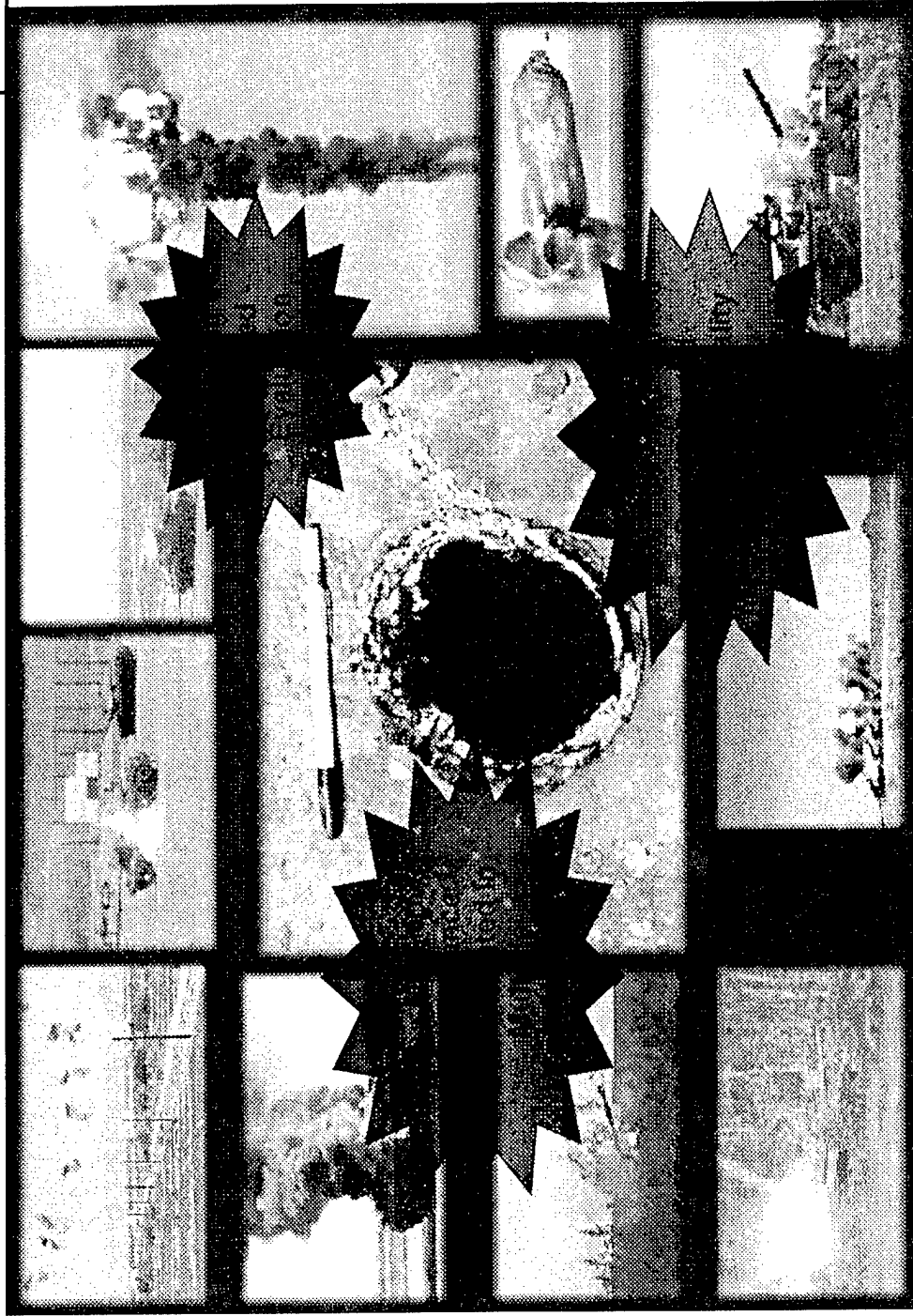
- Man-Made Object Sensing
- Tactical Target Sizing
- Alternate Aiming Sensor
- Corner Reflector Discrimination

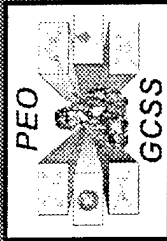
Real-Time Sensor Fusion

M898



SADARM TESTING

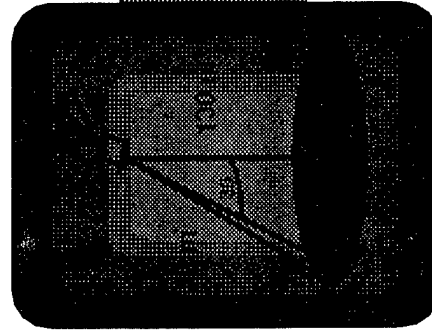




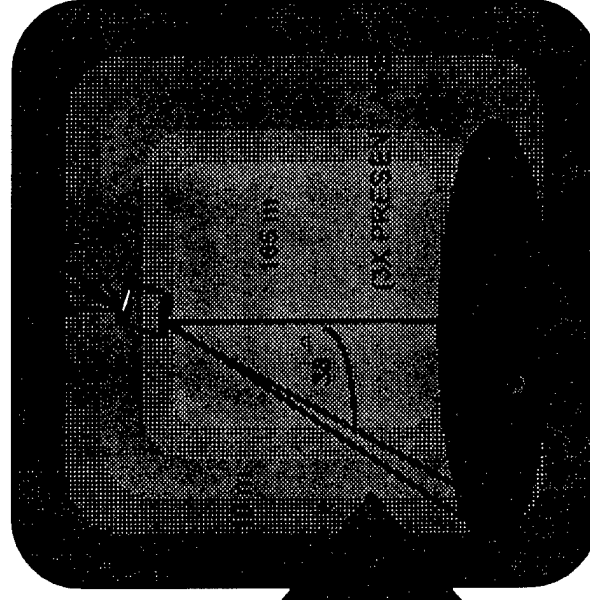
- 3X Footprint Area
- Increase Number of Submunitions that Have a Target in the Footprint From 55% to 80%
- 30 % Fewer Projectiles Required

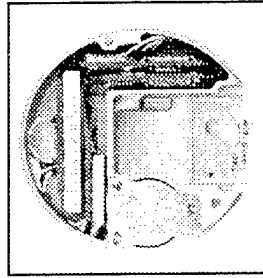
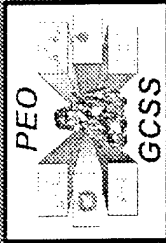
PRODUCT IMPROVEMENT

BASELINE



Increase Hang Angle
Increase Lateral Angle





Electronics Module



Millimeter Wave (MMW) Assembly

Objectives

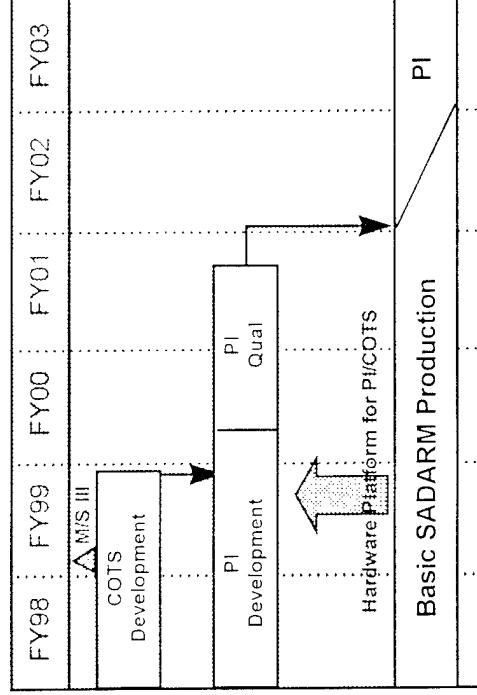
- Reduce Submunition Unit Cost By 22%
- Eliminate Custom Components
- Insert Into Basic Production In FY02
- Increase Effectiveness

Key Features/Benefits

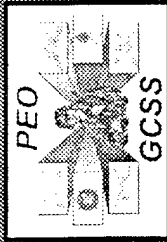
- Fewer Parts
- Commercial Packaging
- Less Complexity
- Structural Improvements
- Avoids Parts Obsolescence
- Higher Yield MMW

Linkage to Basic

- Parts for Qualification
- Support Personnel Working Both Programs
- Production Line Learning



M3000E1

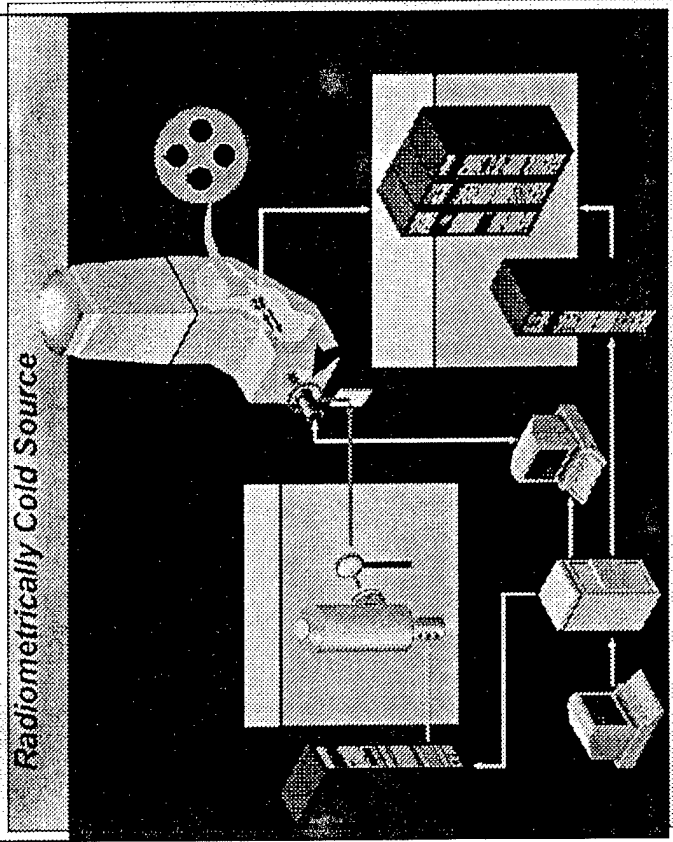
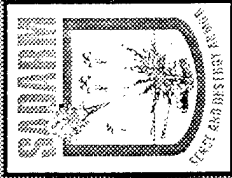
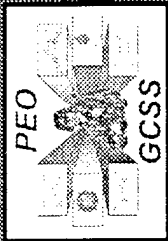


SADARM Modeling and Simulation for Improved Performance Evaluation



- SADARM Development Relied on Expensive & Time Consuming Captive Flight Testing for Sensor Performance Data
 - Data Collected for Multiple Sites and Seasons, Various Targets and Countermeasures
- During Development, a Hardware In The Loop (HWIL) Facility was Established at Redstone Arsenal to Aid Development and Evaluate Production Changes
- Currently Validating With Tactical Gun Firings From Initial Production Tests
 - Environment and Countermeasure Scenarios Form Standardized Test Sets
 - Test Sets Used to Evaluate Future Hardware Changes
-
-

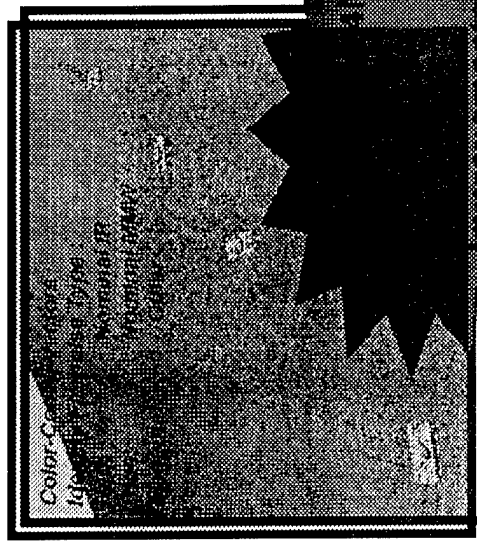
HWIL Will be
Ready to Replace
Captive Flight
Testing



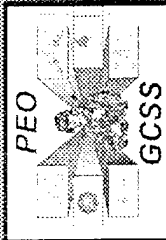
- Interactive Aimpoint Viewer Program - Zoom in on individual targets, or view the scene as a whole, including False Fires.

Hardware-in-the-Loop Simulation

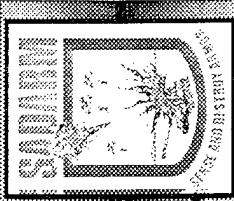
- A Precalculated and Preconvolved Multiband Signature is transmitted to the unit under test (UUT).
- Submunition responds according to its internal signal processing and algorithms.
- Performance data collected.





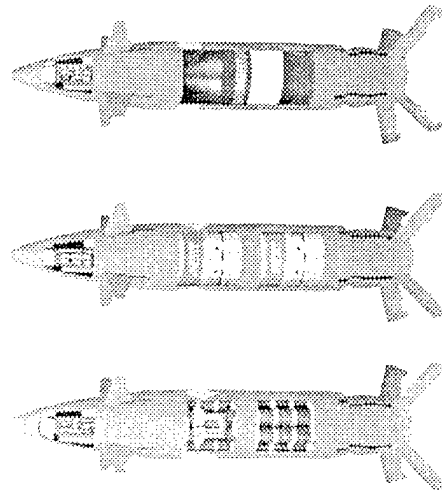


XM900 Description



Provides the commander force with improved the support through an Extended Range, footprint reducing, accuracy enhancing, more lethal family of 155mm projectiles in support of Force XXI operations.

- DPICM with 64 Submunitions
- SADARM with 2 PL SADARM Submunitions
- Unitary with Bunker Penetrating HE Warhead



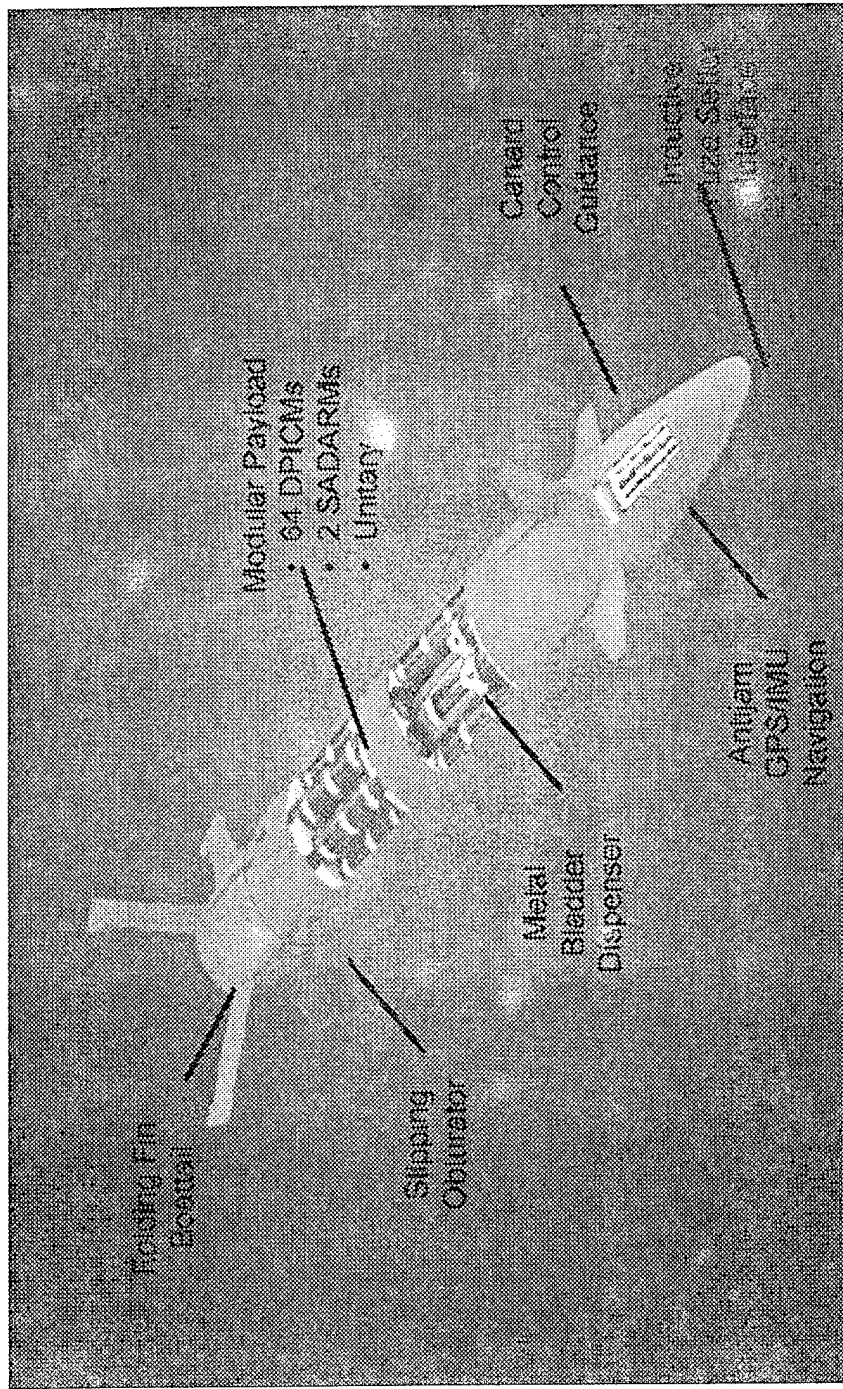
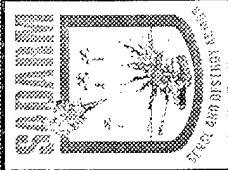
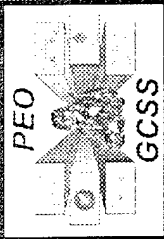
- Increased Range
 - Paladin (M983) JAWISS 28 to 27 Km
 - Crusader 40 to 47 Km
- Increases Survivability Through Greater Stand-off Ranges

XM900 is available in three configurations:

- DPICM 1Q FY04
- SADARM 1Q FY07
- Unitary 1Q FY08

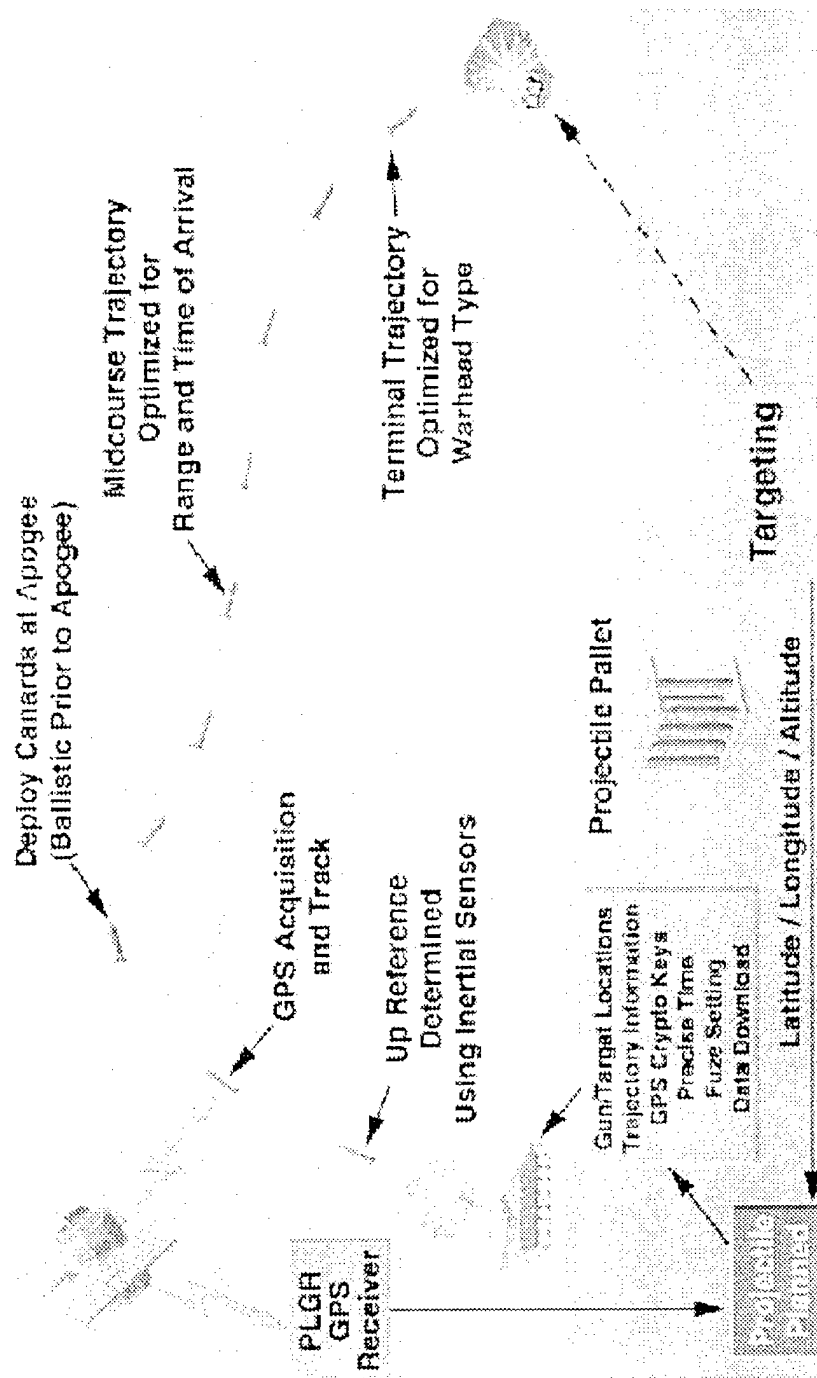
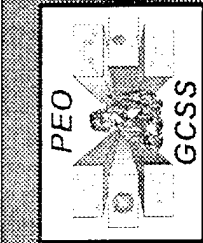
- Backscatter Long Range Self-Destruct Feature
- DPICM Submunitions with Self-Destruct Feature
- On-Board Self Locating System (SLS)
 - GPS / INS Guidance
- Inductive Set Integral Fuse - PIAPS
- Fin Stabilized Glide Air Frame
- Anti-Jam Features
- Modular Projectile Configuration

XM900




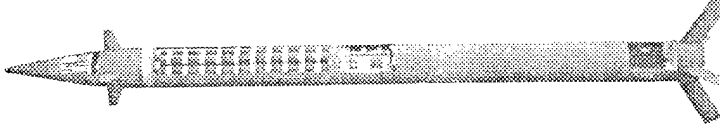
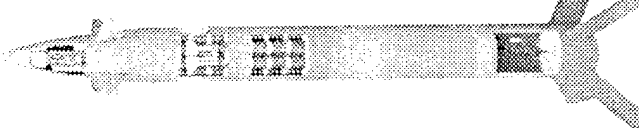
XV982

151

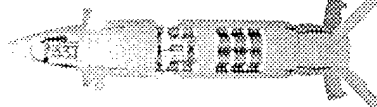




XM992

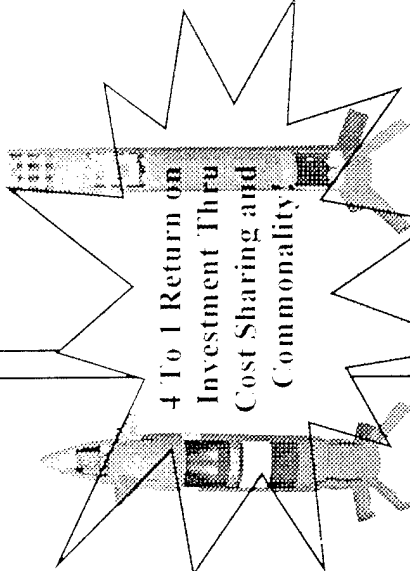
U.S. Navy

| | |
|--|--------------------------------------|
|  | ERGM 127 mm Under Contract |
|  | Best Buy 127 mm Under Contract |
|  | NGNGS 155 mm Awarded |

U.S. Army

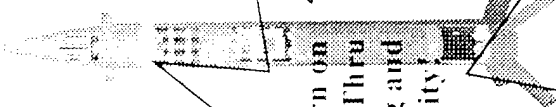




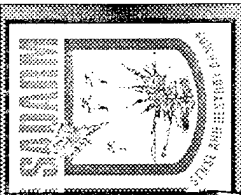
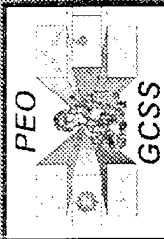
| | | |
|----------------------------------|------------------------------------|-------------------------------------|
| XM982 DPICM Under Contract | XM982 SADARM Contract Option | XM982 Unitary Contract Option |
|----------------------------------|------------------------------------|-------------------------------------|



**4 To 1 Return on
Investment Thru
Cost Sharing and
Commonality**

International

| | |
|--|--|
|  | ERGM Derivative 127mm Under Contract |
|--|--|



FOLDING FIN TAIL
ASSEMBLY

MODULAR AIRFRAME &
PAYLOAD
SAFE & ARM/SELF DESTRUCT
FUZE

SLIPPING OBTURATOR

METAL BLADDER
PAYLOAD EXPULSION &
DISPENSE SYSTEM

CANARD CONTROL
GUIDANCE

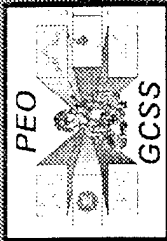
GPS ANTENNAS

ANTILAM GPS/IMU NAVIGATION
GUIDANCE ELECTRONICS

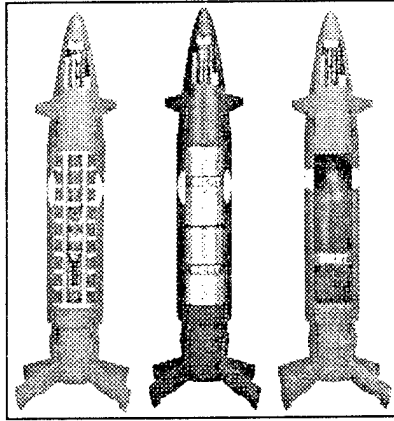
INDUCTIVE FUZE SETTER
INTERFACE

ER
CONVEX SURFACE
ERGNI

X11982



XM982 Horizontal Technology Integration to 155mm Field Artillery

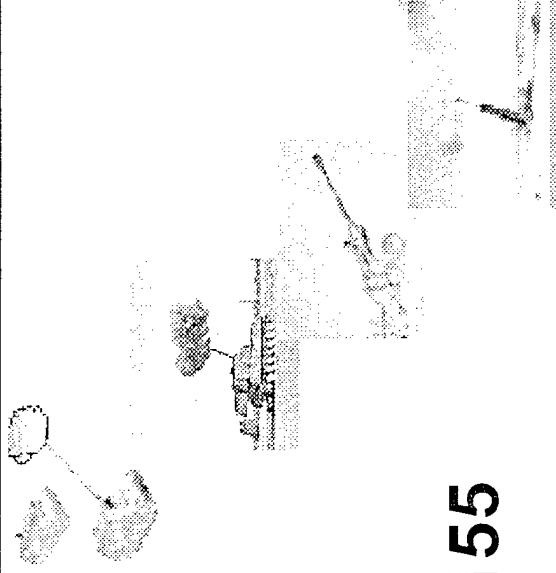


■ Crusader

■ Paladin

■ M198

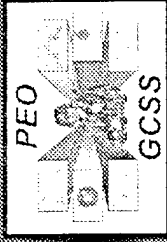
■ LW155



XM982 - Platform Integration Efforts:

- Fire Control Software Upgrades
- Platform Electronics Integration Kits
- Portable Inductive Artillery Fuze Setter (PIAFS) Upgrades
- Pallet Packaging

XM982



■ SADARM

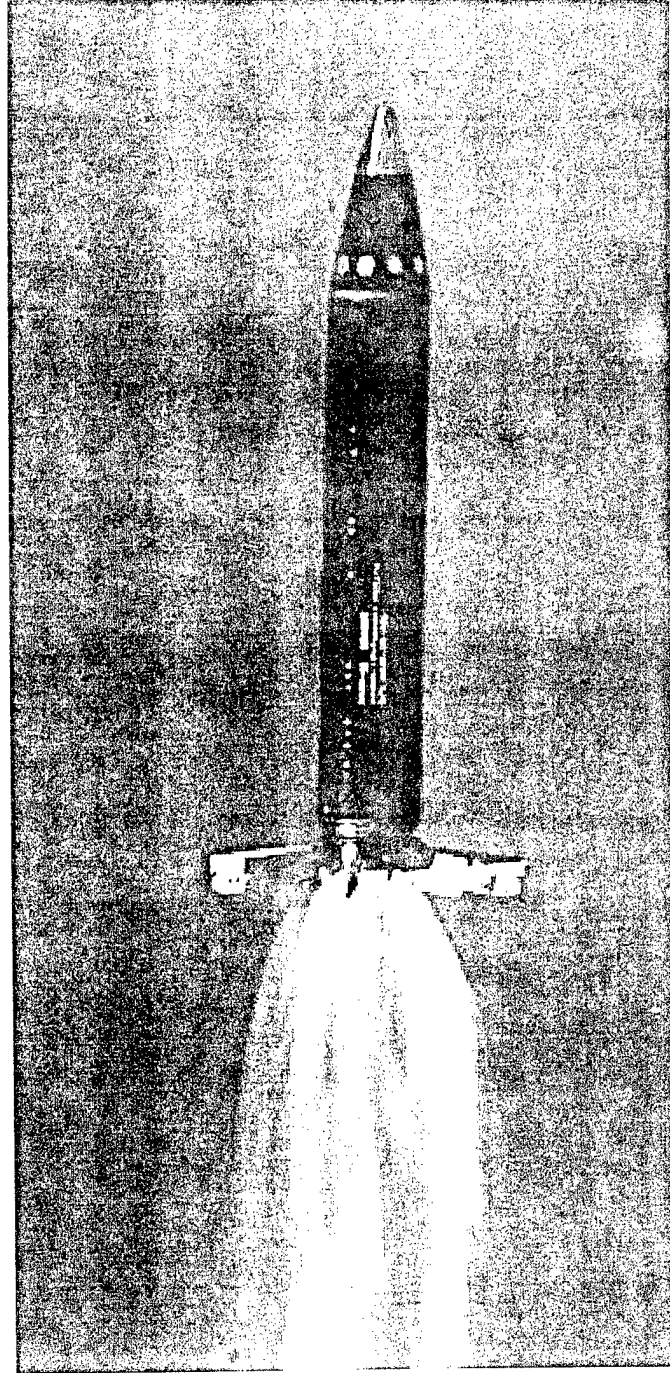
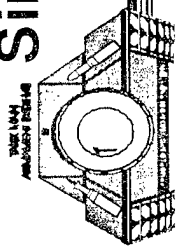
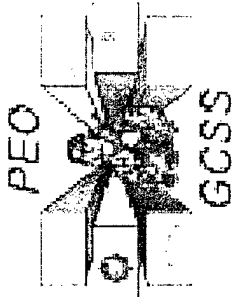
- IPT, LFT&E and IOTE Completed
- Milestone III and First Unit Equipped on Horizon
- PI SADARM Scheduled for FY02 Production Cut-In
- Using M&S to Reduce Costs and Accelerate Program

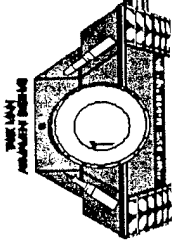


■ XM982

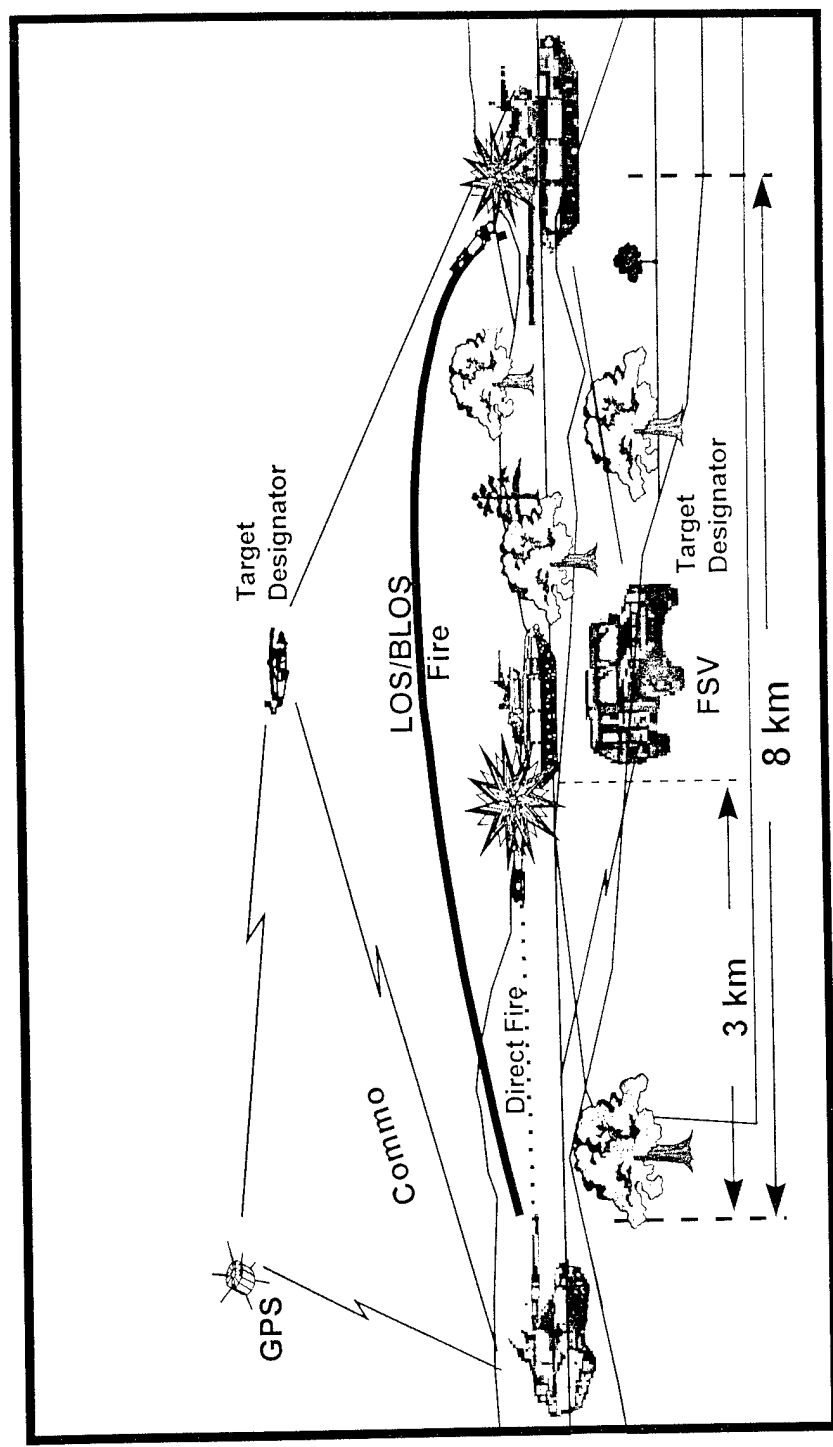
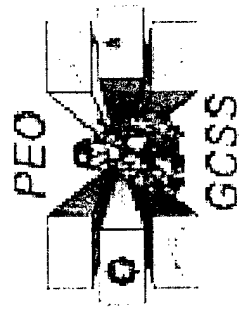
- Increases Range and Effectiveness of Cannon Artillery
- Highly Leveraged Via Cost Sharing and Commonality with US Navy Programs

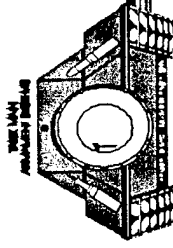
Simulation Based Acquisition (SBA) in XM1007 TERM-KE





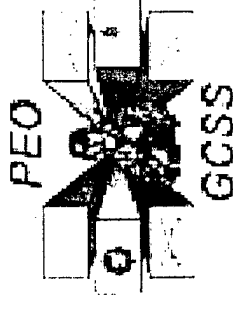
TERM-KE Operational Concept





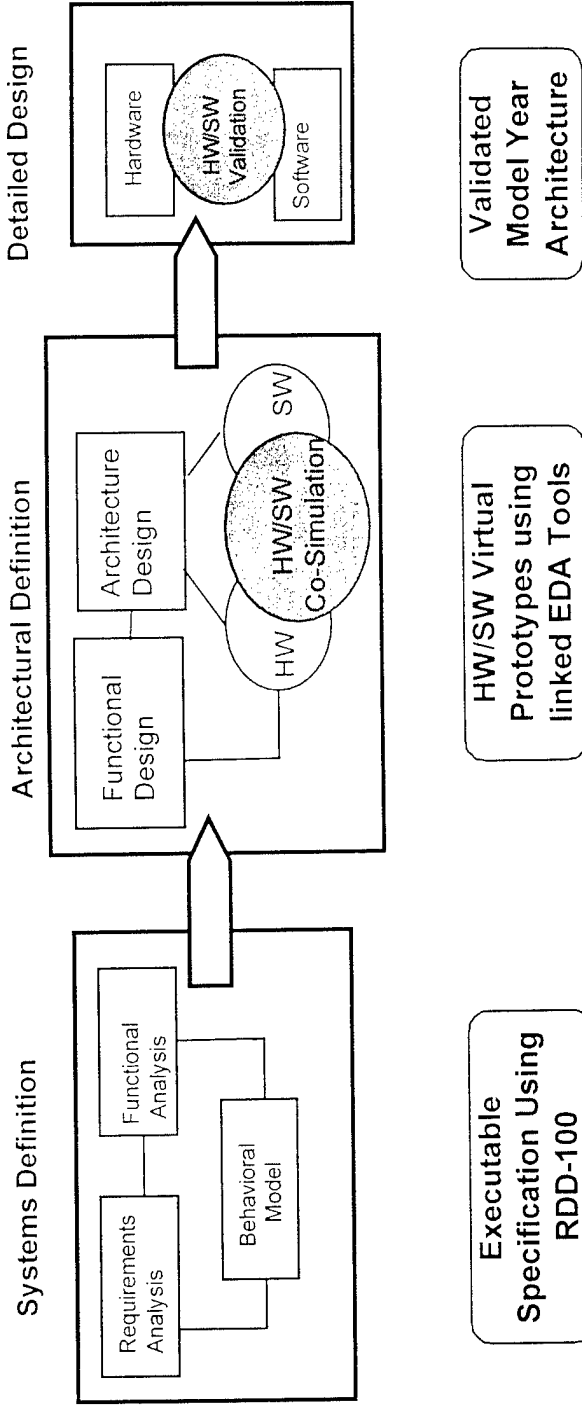
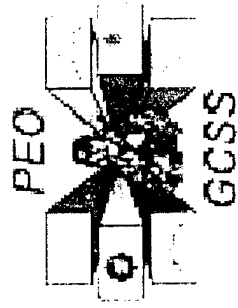
XM1007 TERM-KE's SBA

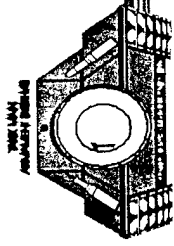
Methodology



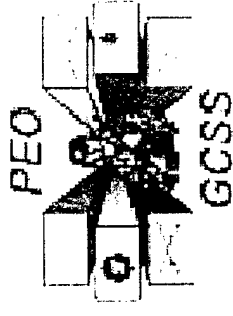
- ◆ Based on comprehensive design process developed under the DARPA Rapid Prototyping of Application Specific Signal Processor (RASSP) program.
- ◆ Methodology anticipates a 4X improvement in design cycle times, cost of design & the quality of design using linked Engineering Design Automation (EDA) tools coupled with concurrent engineering design practices.

RASSP

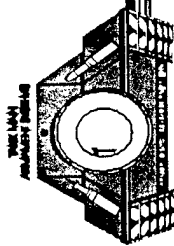




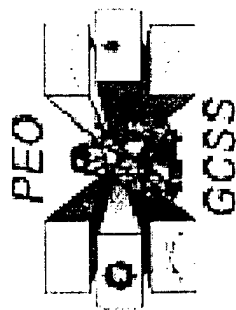
RDD-100



- ◆
- ◆ Is used in the initial phase of the RASSP process, to flow-down requirements, **directly from the customers originating source documents.**
- ◆ Flow-down continues through to the final product specifications, needed for detailed design of the hardware & software.
- ◆ This permits the developer to decompose & track requirements, define functionality, & model the physical system architecture, deriving the optimum system at the lowest life cycle cost.



SYSTEM DEFINITION



Annex G (TERM)
Tank Ammo ORD

DFD Ft. Knox
Guidance

TERM TECHNICAL
DESCRIPTION

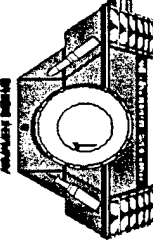
RDD-100

TERM-KE
PERFORMANCE
SPEC

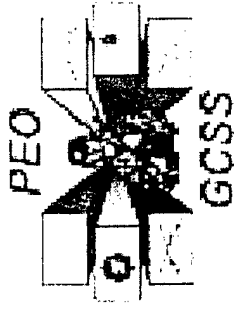
SEEKER Component
Spec

GUIDANCE/CONTROL
Component Spec

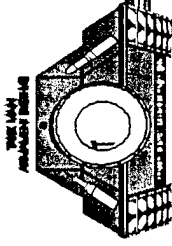
LETHALITY Component
Spec



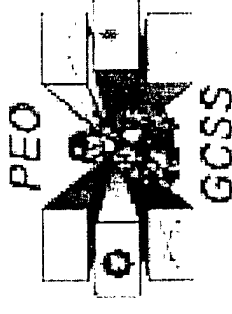
RASSP Modeling



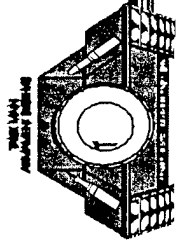
- ◆
- ◆ Following the break down of requirements within RDD-100, the data is automatically processed into executable, architectural simulations of the product systems, and subsystems.
- ◆
- ◆ These simulations automatically mature in parallel with the system requirements, throughout the product life cycle.
- ◆
- ◆ This process, called **behavioral analysis**, is the key capability behind the RASSP concept.
- ◆
- ◆ Model Year Architecture provides the most up to date COTS components, that will perform the functions of the final Detailed Design requirements .



Integrated System Engineering (ISE-RASSP)

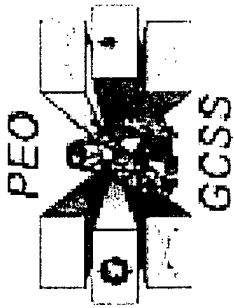


- ◆ In addition to the architectural simulations, the RDD-100 data, ports directly into a variety of other Simulation & Modeling Tools.
- ◆
 - Parametric Cost Estimating Models (PRICE), which produces a Design to Unit Cost Analysis model, & a Life Cycle Cost Analysis model.
 - RAM-ILS which creates Reliability & Maintainability Analysis Models.

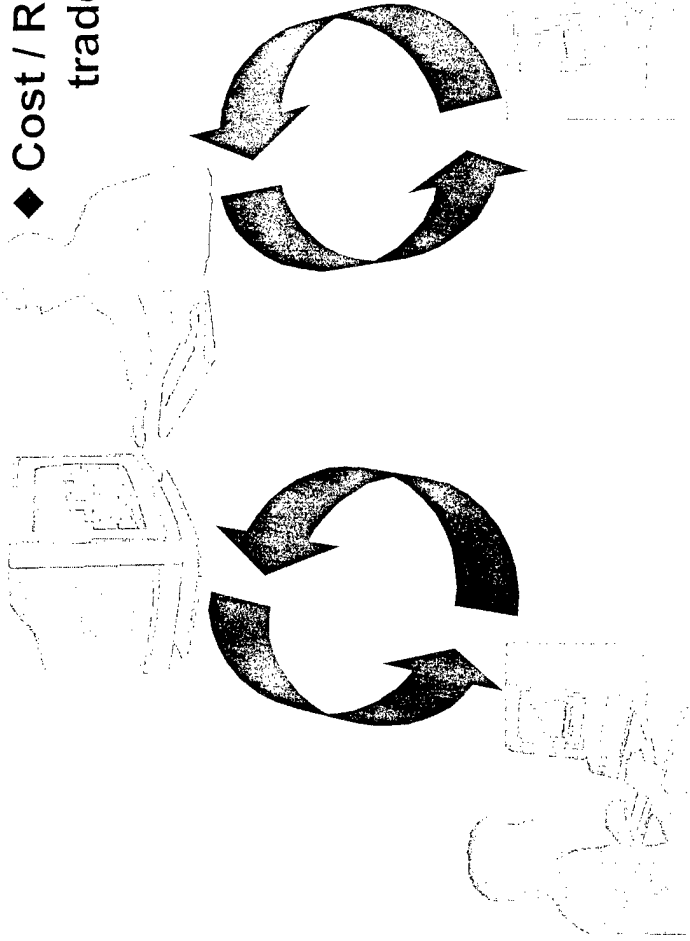


RASSP TOOL INTEGRATION

SYSTEMS ENGINEERING
(RDD-100)



◆ Cost / Requirement / Reliability
trade off studies can all be
performed through
interoperability
of the RASSP
models



COST ANALYST
(PRICE)

RELIABILITY ENGINEER
(RAM-ILS)

R

The Army XXI Firepower Revolution

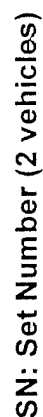
Combat Vehicle Conference

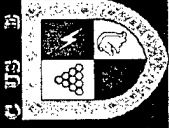
Presented by:

Kevin M. Fahey

DPM Crusader

September 22-23, 1998





Lethal Firepower

- Cooled Cannon for Continuous Fires
- 10-12 Rnds/minute out to 40-50 km
- Enhanced Accuracy with PTS

XM2001



Crew Cockpit Enables Information Dominated Warfare

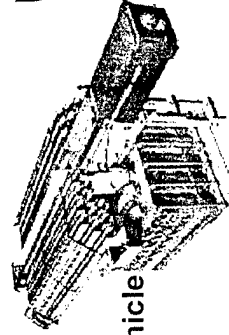
- Mission Planning
- Situational Awareness
- Decision Aids

XM2002



Fully Automated

- Resupply
- Ammunition Handling
- Aiming
- Loading & Firing



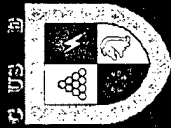
Unmatched Survivability

- Separate Crew & Weapon Stations
- Composite Armor
- Ballistic & Non-ballistic Protection

Highly Mobile

- 1500 HP to Meet & Exceed M1/M2
- First Drive-by-Wire Ground Combat Vehicle
- Ride Quality Better than M1/M2

Crusader Is Not Just Another Howitzer



Major Sub - System

Automated Cannon



Key Features

- Automatic Loading
- Active Thermal Cooling
- Laser Charge Ignition
- Inductive Fuzing

Status

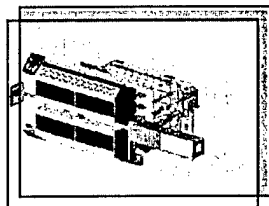
**Achieved Multiple 15 Rd Auto Burst
(Demonstrated 8.6 RPM)**

**Demo'd Functionality of the
Thermal System**

Mount & Cannon in Fabrication

**Demo'd 1 Battlefield Day Firing
with Laser Ignition System**

Automated Resupply/ Ammunition Handling



- Inventory Management
- Storage
- Selection
- Transfer

**Detailed Design Completed
Procuring Objective Hardware**

**Assembling SPH & RSV
Hardware Set #1 in SIF**

**Selected Ammo Identification/
Verification Approach**

Automated C³

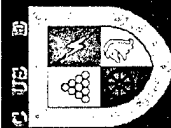


- Fire control
- Weapon Control
- Positioning
- Embedded Training
- Situational Awareness

Hardware in Detailed Design

Software in Preliminary Design

Lo-Fidelity Modeling



Major Sub - System

Key Features

Status

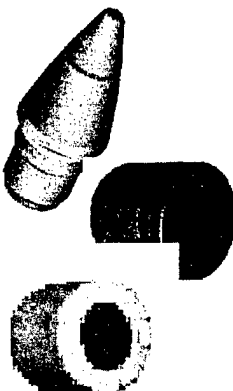
Automotive



- 1500 Horse Power
- Variable Geometry Turbochargers
- Self-Cleaning Air Filter
- Poll-Gut/In Power Pack
- External Hydropropellant Suspension
- Drive-by-Wire
- Composite Armored Hull

Engines & Transmissions
1 - 3 Delivered
Engine Full Power Demo'd
Max Transmission Tractive
Effort Demo'd
Power Pack Test
Ongoing in Propulsion Test
Lab

MACS and MOFA



- Complete Zoning Solution
- Supports 10-12 rd/min
- Rate of Fire
- Significantly Reduced Logistics Tail
- Four Fuse Setting Modes
- Withstands Out-of-Pack Environmental Exposure

Lower Hull Weld-Up In Process
MACS & MOFA Qualification
Testing Ongoing

Type Classification

Complete within 24 months

Survivability



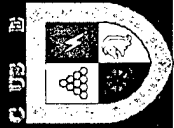
- Protect Crew, System and Mission
- Composite Armor Ballistic Protection
- Ammo & Fuel Compartmentation
- Susceptibility Reduction Features
- NBC Collective Protection with Shift Sleeve Environment
- Automated Fire Suppression

Hull, armor, top attack armor, &
ballistic shock testing ongoing
Propellant compartmentation
testing in process
Fire suppression dispersion
testing completed
NBC system checkout - Oct 98

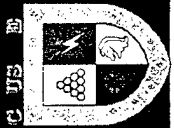
DAES - Sep98



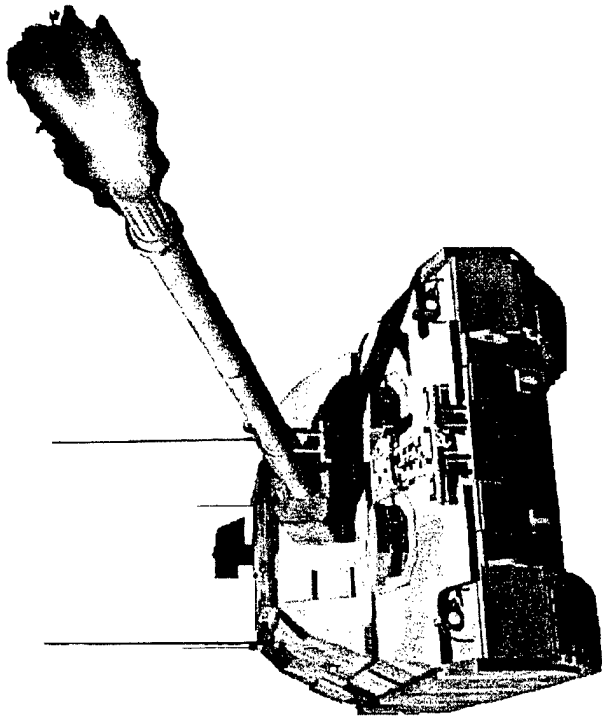
- ❖ Design to Build / Design Phase
- ❖ Software Development/Integration
- ❖ Funding Stability
- ❖ Timely Decisions (Continuous Development Schedule)
- ❖ SASC Report
- ❖ Maintain Technical Imperative
- ❖ Unknown Unknowns

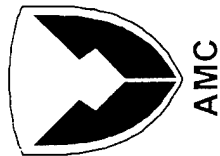


- ❖ **Software Detailed Design**
- ❖ **RSV (-) IAT&C**
- ❖ **RSV (-) Testing**
- ❖ **SPH/RSV Builds**
- ❖ **Crew Trainer**
- ❖ **CEP**
- ❖ **EMD Planning/Proposals/Contract**
- ❖ **Armaments Safety Certifications**
- ❖



- ❖ Requirements Valid
- ❖ Design On-Track & Meets Requirements
- ❖ Program is Affordable
- ❖ Risk Under Control
- ❖ Deliver 1st Prototype Next April

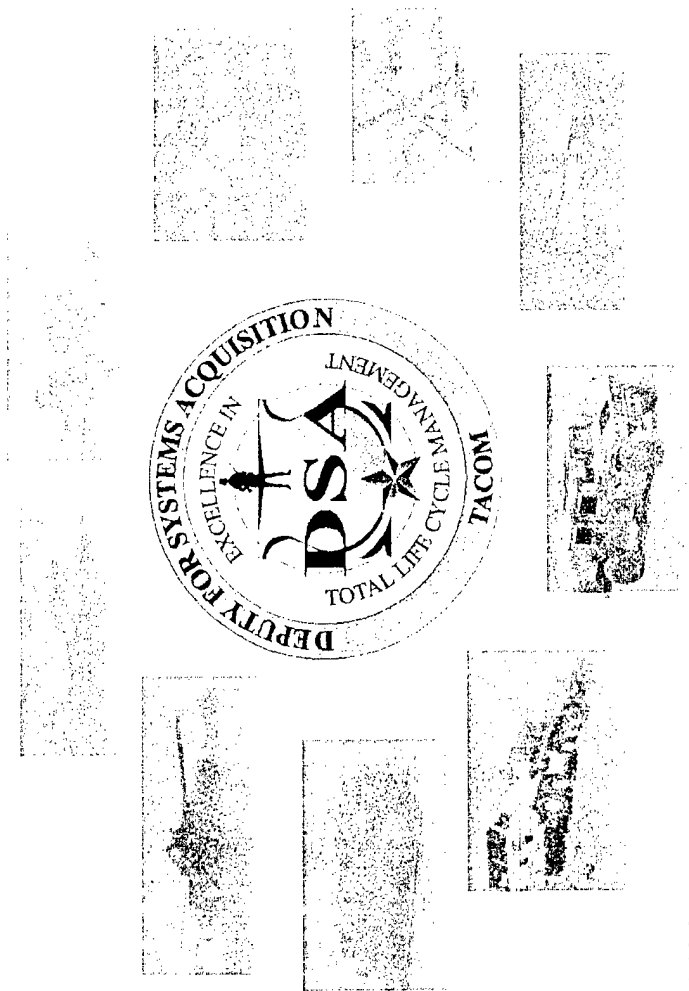




DSA TACOM

Acquisition Modernization

Perspective



COL (P) John M Urias
DSA TACOM

23 Sep 1998

Tank-automotive & Armaments COMmand

Committed to Excellence

207



TACOM

Outline



- Problem Statement
- The DSA Today
- DSA of Tomorrow
- What can Industry do for us?
- On Going Programs
- DSA PM Introduction

23 Sep 98

Committed to Excellence

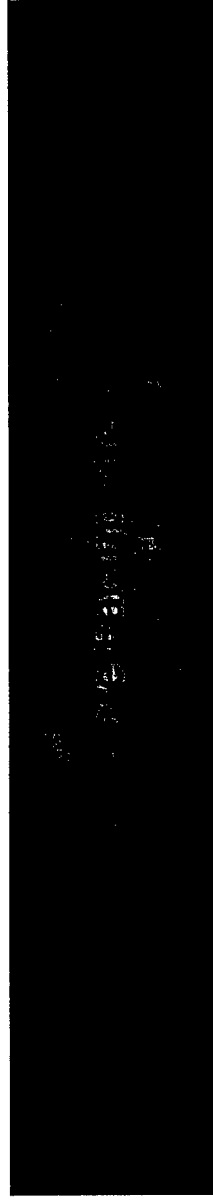
DSA\DSA\urisas\Perspective ppt 9/17/98

203



TACOM

Problem Statement

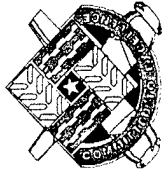


23 Sep 98

Committed to Excellence

DSA DSA/urisas Perspective.ppt 9/17/98

200

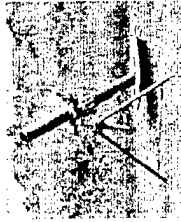


TACOM

36,000+ Tractors
13,000+ HEMTTs
2,900+ PLS
2,100+ Bridges
1,600+ HETs



70,000+ M113 FOV



1000+ 120MM
900+ 81MM
700+ 60MM

100,000+ HMMWV
700+ HMT



9800+ MK19s
600,000+ M16s
1900+ M240
44,000+ M249
40,000+ M4



313+ Marine Systems
1,500+ Rail Cars
800+ Miles of Pipeline
1,200+ Containers

900+

Paladin
900+



460+ Grizzly
360+ HERCULES
2800+ LAV (With FMS)
100+



Wolverine

*Extremely Diverse
Span of Control*

DSA TACOM Programs



23 Sep 98

Committed to Excellence



TACOM

TACOM
TACOM/Picatinny
Picatinny
NCAD
Fl. Belvoir/Picatinny

ASSIST DSA
EXEC OFFICER
BUSINESS MGR
PROCUREMENT SPEC
EXEC SECY
SECY



PM Mines, Countermine and Demolitions

PM TAWS TDA: OPCON TO PM \$828M
DSA TDA: OPCON TO PM PWL
OPCON TO PM-CMS RDTE \$1.1

Over 300 Systems
\$7.4B
Procurement

23 Sep 98

23 Sep 98

Committed to Excellence

FMS
DSA/DSA unites Perspective rpt 9/17/98



TACOM

The Future of the TACOM DSA



- The TACOM DSA is an Evolving Organization
- There will be More Force Structure Cuts to TACOM and the DSA in the Future
- We are Working our Organizational Structure now to Meet our Customers Needs and Absorbs These Cuts
- There are Very few new Systems
 - TACOM DSA is Mostly Legacy Systems That will Remain in Inventory a Long Time
 - These Systems Need Support & Modernization to Meet the Needs of a Changing Army

Key Issue:
Life Cycle Mgt

23 Sep 98

Committed to Excellence

DSADSA\trisas\Perspective.ppt 9/17/98

219



TACOM

We Need Industry's Help

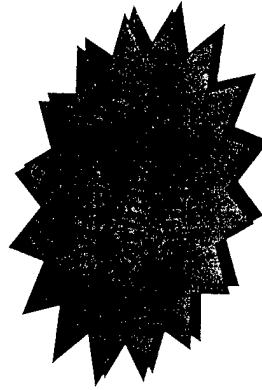
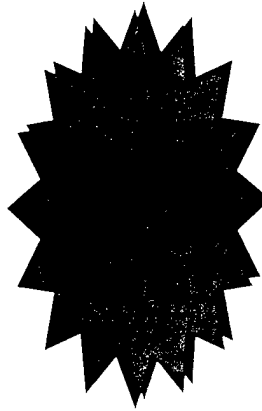


Extend the
Life of Legacy
Systems

Reduce Logistics
Requirements
of our Systems



Meet
Maintenance
Requirements
at Affordably
Low Age-Related
Costs



23 Sep 98

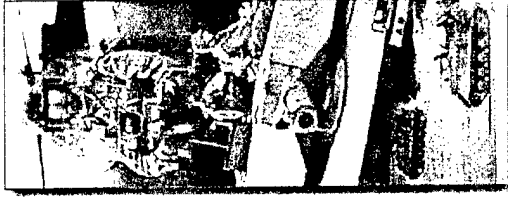
Committed to Excellence



TACOM

On Going Programs

- MTS
- Wireless TOC
- Combatt
- ABS Braking Systems
- Engine Improvements
- Paperless PM
- Tire Pressure Monitoring System



WRAP:

- GATOR

SBIR:

- TACOM Personnel Heater
- Filterless Heat Exchanger (M109)

ACT II:

- Hands Free Wireless Communications
- Ladar Targeting System

We Need More Programs Like These

23 Sep 98

Committed to Excellence

237





TACOM

Summary



- DSA Provides Oversight for Over 300 Very Diverse Systems
- Major Shift in TACOM Operations to Incorporate Best Business Practices
- Lengthy Support Horizon is a Reality for Most of our Systems
- A Strong Government-Industry Team is Critical to our Success

23 Sep 98

Committed to Excellence

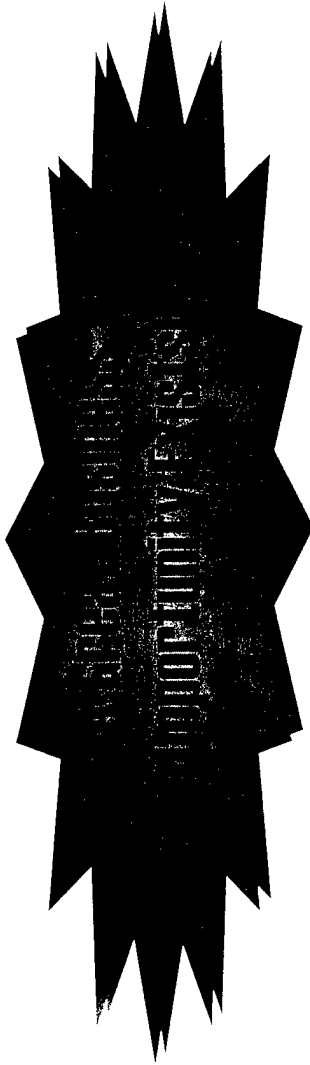
DSA\DSA\urisas\Perspective.ppt 9/17/98

215



TACOM

Conclusion



- AAN Tenets Mandate Ultra-Reliable Systems
- We are Entering the AAN Age With Legacy Systems that will Require Upgrading, Product Improvements and Life Extension Programs

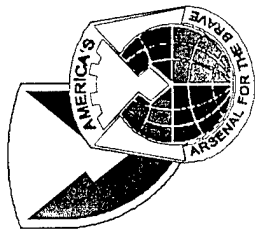
**We can not Allow an AAN That is
Supplied by Horses!**

23 Sep 98

Committed to Excellence

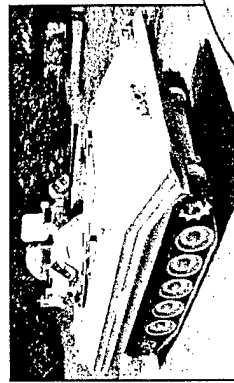
DSA\DSA\urisas Perspective ppt 9/17/98

011

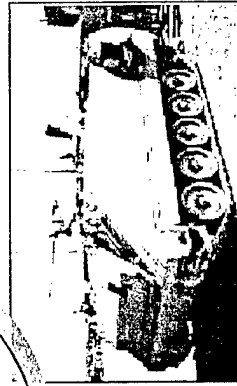
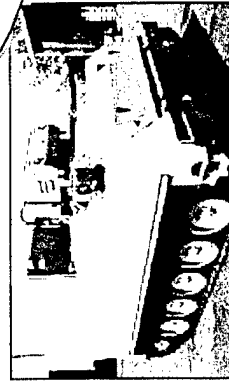


LACOM

***Mobility and Firepower
for America's Army***



M113 FOV Overview Combat Vehicle Conference Sep 98



LTC David Ogg
PM M113/M60 FOV

Tank-automotive & Armaments CONmand

AGENDA

- ◆ Mission
- ◆
- ◆ Organization
- ◆
- ◆ M113 Family of Vehicles Overview
- ◆
- ◆ Industry Overview
- ◆
- ◆ Summary

23 Sep 98

Committed to Excellence

216

MISSION

To Develop, Produce, Modernize
And Sustain The M113/M60
Family Of Vehicles, Through
Innovative, Yet Sound Program
Management, Always Mindful Of
The Requirements Of The
Ultimate Customer.

23 Sep 98

Committed to Excellence

COMMAND ORGANIZATION

AMC
GEN J. Wilson

TACOM
MG R. Beauchamp

TACOM DSA
COL (P) J. Urias

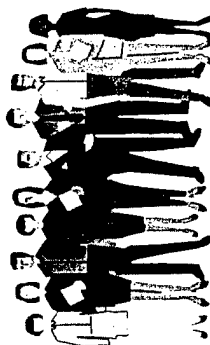
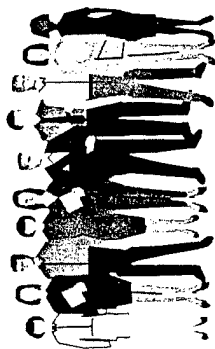
PM TAWS
COL M. Cannon

PM M113
LTC D. Ogg

23 Sep 98

Committed to Excellence

200



M113 FOV REQUIREMENTS

- ◆
- ◆ ODS After Action Report:
 - ✓ “Upgrade M113 FOV To Keep Pace With Abrams/Bradley”
- ◆
- ◆ Tracked Vehicle Platform Conversion/Upgrade:
 - ✓ DCSOPS Priority: Customer; FPI-II
 - ✓ Highly Mobile, Survivable, And Reliable
 - ✓ Specialized Mission Modules Integration
 - ✓ Current/Future Adaptive
 - Force XXI/AAN

17,500
M113 FOVs
In Army
Inventory Today

No Replacement For The M113 FOV Has Been Programmed

23 Sep 98

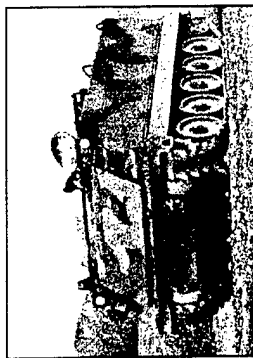
Committed to Excellence

221

M113 SUPPORT HORIZON

1960

M113 (Gasoline)
M577 (CMD Track), M106 (Mortar)



1964

M113A1 (Diesel)
M125 (Mortar), M548 (CGO Track),
M667 (Lance), M730 (Chap), M741 (Vulcan)

1979

M113A2 (Cooling And Suspension)
M901 (ITV), M981 (FISTV), M1015 (IEW)

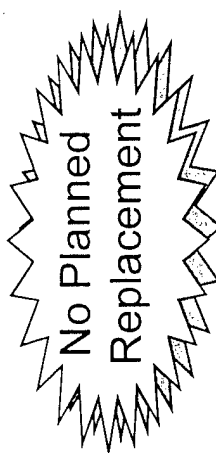
1987

M113A3 (RISE Upgrade)
M1059 (Smoke), M1064 (Mortar),
M1068 (SICPS), OSV (BMP-2), M58 (Smoke)



2025 ...

Force XXI and AAN



23 Sep 98

Committed to Excellence

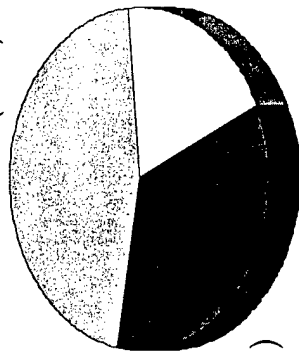
223

COMBAT VEHICLE DENSITY

Current Division Density (1,386)

New Division Density (862)

M113 FOV (637)

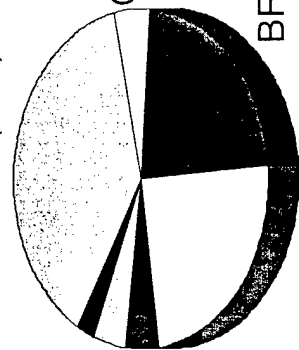


BFVS (428)

Abrams
(267)

Crusader/
Paladins (54)

M113 FOV (330)



Abrams
(207)

BFVS (196)

MLRS (18)

FAASV (36)

Crusader/
Paladins (36)

C2V (39)

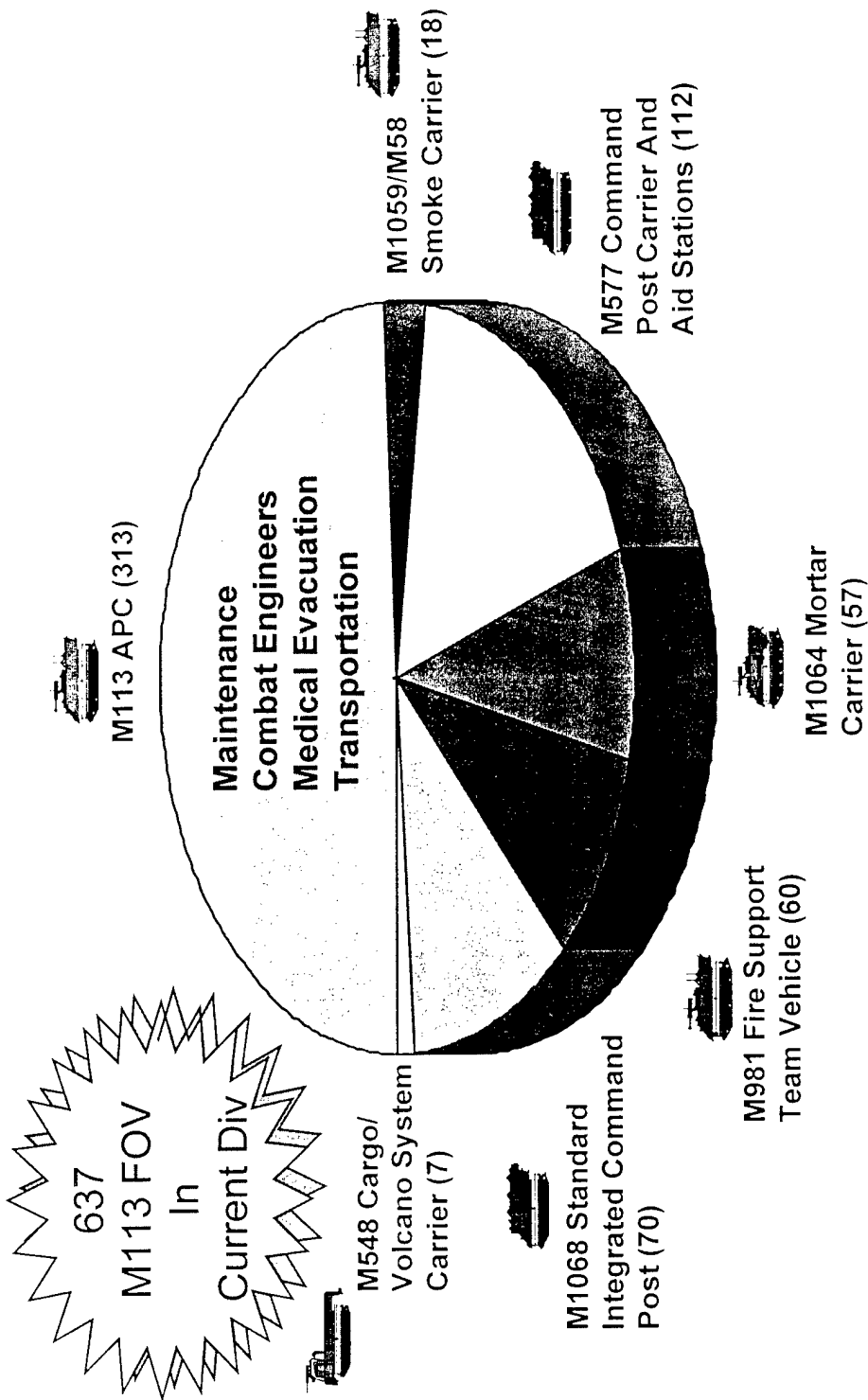
As of 9/17/98

M113 FOV Represents 46% of Old Division Density and 40% of New Division Density

23 Sep 98

Committed to Excellence

CURRENT M113 FOV MISSION BREAKOUT

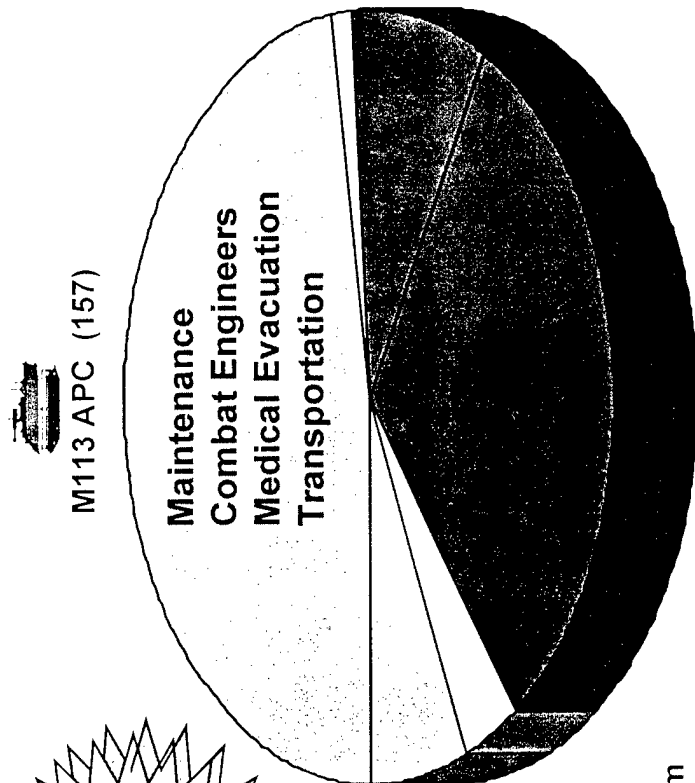


23 Sep 98

Committed to Excellence

NEW M113 FOV MISSION BREAKOUT

330
M113 FOV
In
New Div



M113 APC (157)



M577 Command
Post Carrier (4)



M1064 Mortar
Carrier (30)



M981 Fire Support
Team Vehicle (21)



M548 Cargo/
Volcano System
Carrier (12)



M1068 Standard
Integrated Command
Post And Aid Station (106)

As Of: 9/17/98

23 Sep 98

Committed to Excellence

225

CURRENT M113 FOV FP I & II REQUIREMENTS

| VEHICLE TYPE | TOTAL REQ'D | FIELD TO DATE | REMAINING |
|---------------------------|-------------|---------------|-----------|
| M1064A3 (120mm Mortar) | 349* | 299 | 50 |
| Op Forces Surro Veh (OSV) | 133* | 12 | 121 |
| M58 (Smoke Generator) | 140* | 42 | 98 |
| M1068A3 (SICPS) | 623 | 0 | 623 |
| M113A3 (APC) | 1,779 | 1,252 | 527 |
| M577A3 (Command Post) | 703 | 42 | 661 |
| M548A3 (Volcano/Cargo) | 103 | 103 | 0 |
| M113 FOV TOTAL | 3,830 | 1,750 | 2,080 |

* Includes FP III Requirements

Complete: FP I = FY04; FP II = FY07

Does Not Support Force XXI Timeline

23 Sep 98

Committed to Excellence

229

M113A2, M113A3, BFVS PERFORMANCE DATA

| Vehicle Features | M113A2 | M113A3 | Bradley M2A2 |
|----------------------------|------------------------|------------------------|--------------|
| Combat Weight | 25,000 lbs | 27,200 lbs | 60,300 lbs |
| Engine | 212 hp | 275 hp | 600 hp |
| HP/Ton | 16.9 | 20.4 | 20 |
| Speed (Level) | 37.7 mph | 41 mph | 40 mph |
| Acceleration (0-30 mph) | 40.3 sec | 21.7 sec | 18 sec |
| Cost To Operate/Mile (\$) | 13.83 | 12.89 | 49.40 |
| MMBF Req't/Actual | 750/1,902 hrs | 850/2,202 hrs | 240/750 hrs |
| Cruising Range | 300 miles | 300 miles | 265 miles |
| Trench Crossing | 66 in | 66 in | 100 in |
| Payload Capacity | 3,000 lbs | 3,000 lbs | 5,700 lbs |
| Armor Protection (Defeats) | 7.62 mm/Frag | 7.62mm/Frag | 30 mm |
| Deployability | C130,C141, C17 & C5 | C130,C141, C17 & C5 | C17 & C5 |

Problem: Resources Don't Equal Requirements

23 Sep 98

Committed to Excellence

227

M113 STRATEGY XXI

Issue: M113's Current Program Doesn't Support Force XXI Or AAN:

- ◆ Obtain DCSOPS Guidance to Reprioritize Upgrade Program to Support Force XXI - Division/Corp
- ◆
- ◆ Obtain Approval to Realign Vehicle Propronency with "School House"
- ◆
- ◆ Manifest a TACOM/Industrial Upgrade Partnership
- ◆
- ◆ Continue to Tell and Sell the M113 Program
 - ✓ Ensure Stable Funding and Requirements



23 Sep 98

Committed to Excellence

226

M113 FIELDING STRATEGY

Current Guidance: Customer; FP I & II; Others

FP I 1,150/1,919

FP II 603/1,437

Div XXI 12/306

Corp XXI 691/1,587

| FY | 99 | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 |
|----|----|----|----|----|----|----|----|----|----|----|----|----|
|----|----|----|----|----|----|----|----|----|----|----|----|----|

New Strategy: Force XXI Div/Corp; Customer; FP I & II; Others

Div XXI* 12/306 * Redistribute M1064A3 Mortar Carriers

Corp XXI 691/1,587

FP I 1,150/1,409

FP II 603/1324

FORCE XXI: 4th ID = 1% A3s; Corps = 43% A3s

23 Sep 98

Committed to Excellence

\$625M
To
Complete
By
FY07

No
Additional
Funding
Required

M113 FOV SYSTEM

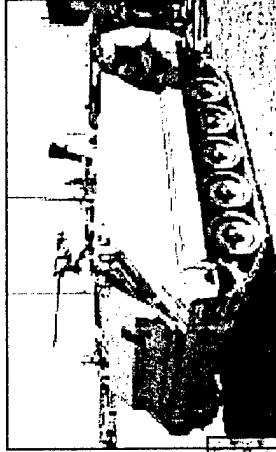
M58



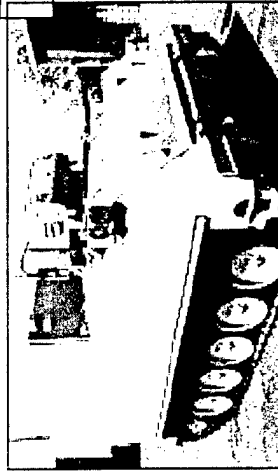
M113



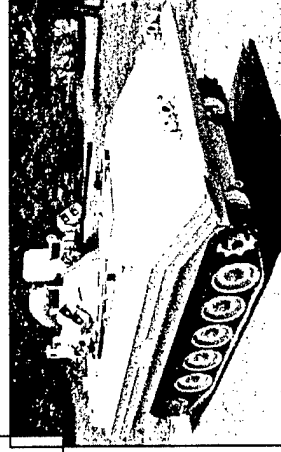
M1064



M1068



OSV



M113 PROPONENT & USERS

| VEHICLES | PROponent | USERS |
|--|-----------------|--------------------------------------|
| M113 CO/1SG Ambulance Maintenance | Infantry School | INF, AR INF, AR, FA AR, AV, FA |
| M577 Command Post | Infantry School | AR |
| M1068 Command Post Medical FDC | Infantry School | INF, AR AR, EN AR, FA |
| M1064 Mortar | Infantry School | FA |
| M548 Volcano | Infantry School | FA |
| M58 Smoke Carrier | Infantry School | CHEM |
| OSV | Infantry School | NTC |

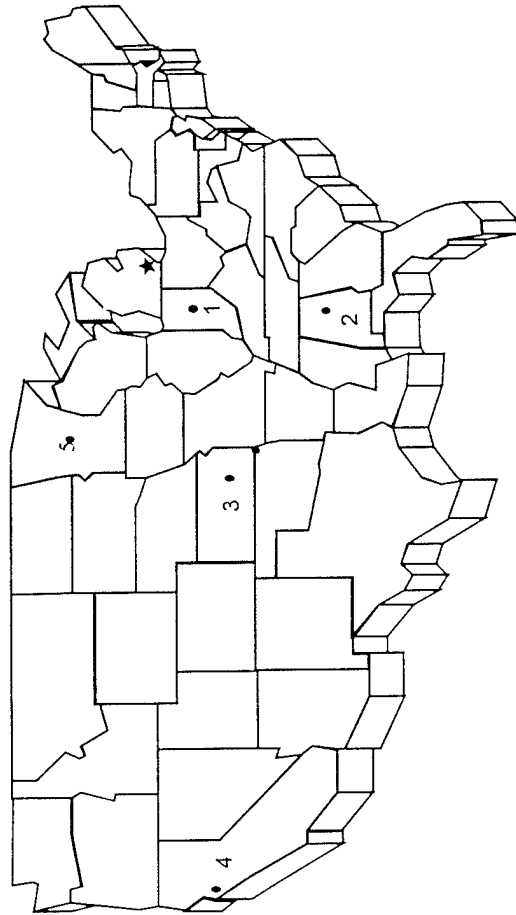
24 Sep 98

Committed to Excellence

M113 Family of Vehicles (FOV)

FY98 Fiscal and Congressional Information

| | | | |
|-----------------------|-------------------------|--------------|-------------------|
| 1. Indiana | | | |
| SEN Lugar (R) | SEN Coats (R, SASC) | | |
| REP McIntosh (R-2) | REP Burton (R-6) | | |
| REP Praise (R-7) | REP Carson (D-10) | | |
| Contractor | City (Dist) | Major Comp | FY98 Jobs FY98 \$ |
| Allison Trans. | Indianapolis (2,6,7,10) | Transmission | 20+ 13.7M |
| State Totals | | | |
| | | | 20+ 13.7M |
| 2. Alabama | | | |
| SEN Shelby (R, SAC) | SEN Sessions (R) | | |
| REP Riley (R-3, HNSC) | | | |
| Contractor | City (Dist) | Major Comp | FY98 Jobs FY98 \$ |
| United Def. | Anniston (3) | Application* | 180 + 18.8M |
| ANAD | Anniston (3) | Application | 310+ 14.1M |
| State Totals | | | |
| | | | 490+ 32.9M |
| 3. Kansas | | | |
| SEN Roberts (R, SASC) | SEN Brownback (R) | | |
| REP Moran (R-1) | | | |
| Contractor | City (Dist) | Major Comp | FY98 Jobs FY98 \$ |
| Detroit Diesel | Emporia (1) | Engine | 20+ 3.3M |
| State Totals | | | |
| | | | 20+ 3.3M |
| 4. California | | | |
| SEN Feinstein (D) | SEN Boxer (D, SAC) | | |
| REP Miller (D-7) | REP Pelosi (D-8, HAC) | | |
| REP Vacant (9) | REP Tauscher (D-10) | | |
| REP Pombo (R-11) | REP Lantos (D-12) | | |
| REP Eshoo (D-14) | REP Campbell (R-15) | | |
| Contractor | City (Dist) | Major Comp | FY98 Jobs FY98 \$ |
| United Def. | San Jose (7-16) | Eng Services | 20+ 3.5M |
| State Totals | | | |
| | | | 20+ 3.5M |



| | | | |
|------------------------------|----------------|--------------|-------------------|
| 5. Minnesota | | | |
| SEN Wellstone (D) | SEN Grams (R) | | |
| REP Ramstad (R-3) | | | |
| Contractor | City (Dist) | Major Comp | FY98 Jobs FY98 \$ |
| NAPCO | Minnnetonka(3) | Conv. Kits | 110+ 15.9M |
| State Totals | | | |
| | | | 110+ 15.9M |
| Total Program Summary | | | |
| | | Top 5 | Other |
| # States: | | 5 | 0 |
| # Contractor Jobs | | 350+ | 0 |
| # Government Jobs | | 310 + | 0 |
| FY98 \$ Budgeted: | | \$69.3M | \$69.3M |

Legend

- Jobs rounded to nearest 10 for FY98
- **FY98 Program Budget \$** rounded to nearest \$100,000
- (D-1): indicates Party and Congressional District.
- (6): indicates Congressional District
- **Map dots** indicate Location of Top 3 Contractors in State
- **Star** indicates PEO/PM location
- ☐ **Top 5 (or less)** States with Program Contractors
- ☐ **Other States** with Program Contractors

Committed to Excellence

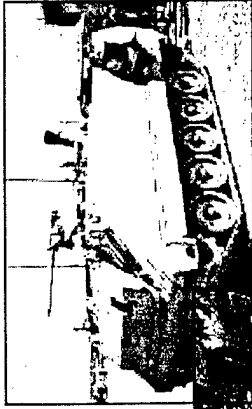
23 Sep 98

PM M113 AND INDUSTRY INITIATIVES

- ◆ Partnership of Overhaul/Conversion Vehicles: TACOM/ANAD/UDLP
 - ✓ FY97: 332 Vehicles; 16% Cost Savings
 - ✓ FY98: 242 Vehicles; 20% Cost Savings
- ◆ Alpha Contracting Initiative: M1068 SICP Kits - UDLP
- ◆ A3 RISE Conversion Kits: NAPCO International
- ◆ Detroit Diesel: Electronic Controlled Engine Upgrade
- ◆ Allison Transmission: X400A Transmission Upgrade
- ◆ TRW: Applique' Supporting Force XXI
- ◆

Outstanding History
Of M113
Support & Production

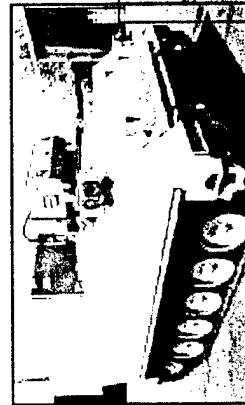
M113 FOV FUTURE



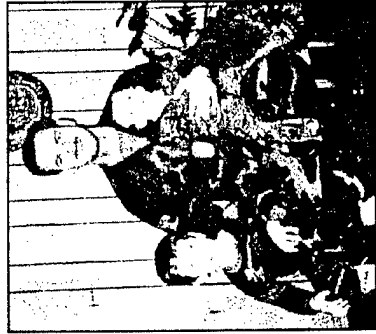
1960



With No Replacement In The Foreseeable Future...
The M113 FOV Will Continue To Support The
21st Century Soldier



2025 . . .



23 Sep 98

Committed to Excellence

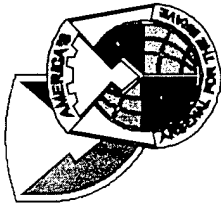
SUMMARY

Industry And PM M113
Keeping
The Legend Alive

M113: Legacy To Legend ... The Legend Lives On

23 Sep 98

Committed to Excellence



HMMWV Life Cycle Mgt Strategy Presentation for Combat Vehicle Conference

Nancy A. Moulton
Project Manager,
Light Tactical Vehicles

23 Sep '98

Tank-automotive & Armaments COMmand

HMMWVs SUPPORT OUR COMBAT MISSION



Important in the
Combined
Arms Operations

A critical platform in
support of the 7
Battlefield
Operating Systems in
all potential
theaters of operations

1714 HMMWVs
Required in
Heavy Division

95,616 HMMWVs
worldwide

Committed to Excellence

23 Sep '08

UPARMORED HMMWVS XM1114

Material Release: 1Q/FY99
Supports Scout and MP missions



Survivability
features
proven in two
combat
incidents

USAREUR
maintain
92% OR
on 409
vehicles

Over 2
million miles
logged on
Bosnian assets

Actual
MMBMBF
is almost
twice the
projected rate

Distribution:
Bosnia: 409
Special Operations Command:
72
Forces Command: 776
Korea: 175
National Guard: 29
Armor School: 10
MP School: 5

HMMWV

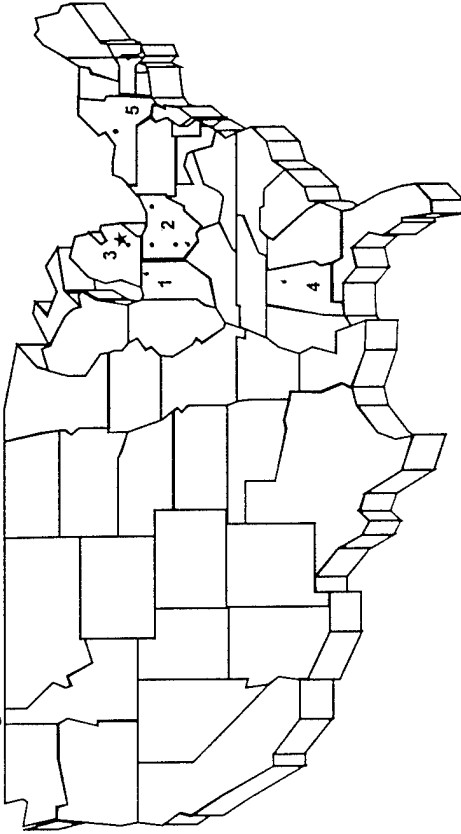
FY99 Fiscal and Congressional Information

| 1. Indiana | | | |
|----------------------|------------------|------------|------------------|
| SEN Coats (R) (SASC) | SEN Lugar (R) | | |
| REP Roemer (D-3) | REP Souder (R-4) | | |
| Contractor | City (Dist) | Major Comp | FY99 Jobs FY98\$ |
| AM General | Mishawaka (3) | Prime | 1352 96.1M |
| AM General | South Bend (3) | Stamping | 30 5.5M |
| Dana | Ft Wayne (4) | Axles | 30 2.8M |
| State Totals | | 1,412 | 104.4M |

| 2. Ohio | | | |
|-------------------|----------------------|------------|------------------|
| SEN DeWine (R) | SEN Glenn (D) (SASC) | | |
| REP Boehner (R-8) | REP Gillmor (R-5) | | |
| REP Hall (D-3) | REP Sawyer (D-14) | | |
| Contractor | City (Dist) | Major Comp | FY99 Jobs FY98\$ |
| GM Diesel | Moraine (3) | Engine | 20 10.1M |
| O'Gara-Hess | Fairfield (8) | Armor | 20 24.5M |
| Hayes | Akron (14) | Wheels | 10 1.2M |
| Defiance | Defiance(5) | Stampings | 15 1.2M |
| State Totals | | 65 | 37.0M |

| 3. Michigan | | | |
|-------------------|----------------------|---------------|------------------|
| SEN Abraham (R) | SEN Levin (D) (SASC) | | |
| REP Rivers (D-13) | | | |
| Contractor | City (Dist) | Major Comp | FY99 Jobs FY98\$ |
| GM | Ypsilanti (13) | Transmissions | 40 4.7M |
| State Totals | | 40 | 4.7M |

| 4. Alabama | | | |
|--------------------------|----------------------|------------|------------------|
| SEN Sessions | SEN Shelby (R) (SAC) | | |
| REP Aderholt (R-4) (HAC) | | | |
| Contractor | City (Dist) | Major Comp | FY99 Jobs FY98\$ |
| Goodyear | Gadsden | Tires | 6 2.1M |
| Totals | | 6 | 2.1M |



| 5. New York | | | |
|------------------|------------------|------------|------------------|
| SEN D'Amato (R) | SEN Moynihan (D) | | |
| REP Walsh (R-25) | | | |
| Contractor | City (Dist) | Major Comp | FY99 Jobs FY98\$ |
| New Venture E. | Syracuse (25) | Xfer Case | 6 1.8M |
| State Totals | | 6 | 1.8M |

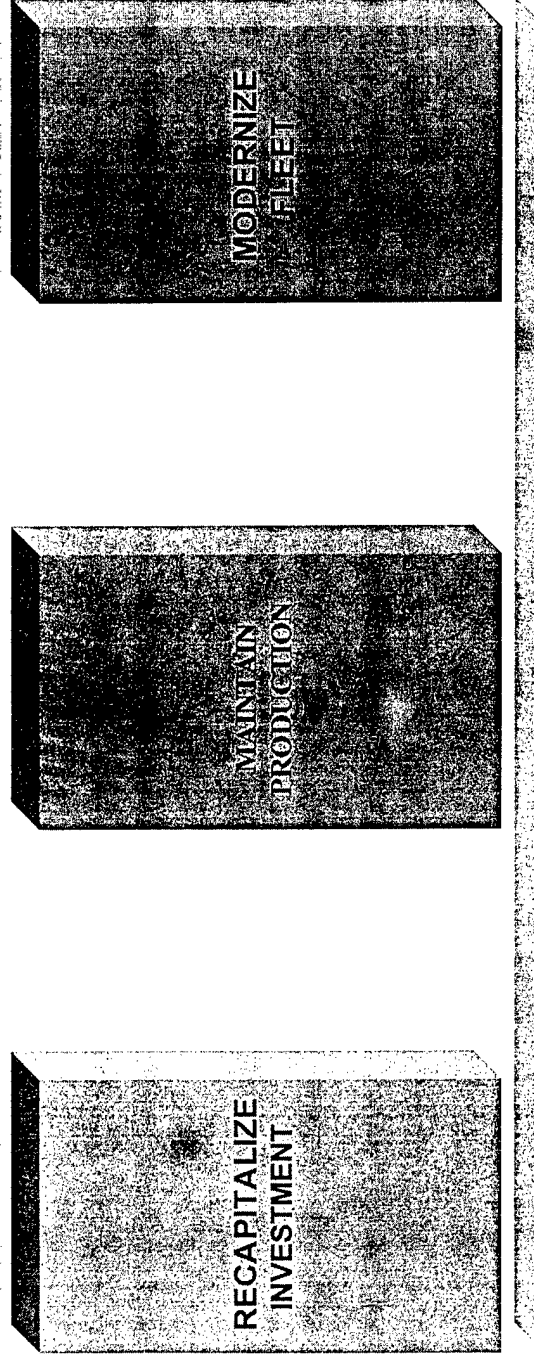
| Total Program Summary | | | |
|-----------------------|---------|-------|---------|
| | Top 5 | Other | Total |
| # States: | 5 | | 5 |
| # Contractor Jobs: | 1,529 | | 1,529 |
| # Government Jobs: | 46 | | 46 |
| FY99 \$ Budgeted: | \$12.1M | | \$12.1M |

- Legend**
- Jobs rounded to nearest 10 for FY98
 - FY99 Program Budget \$ rounded to nearest \$100,000
 - (D-1): indicates Party and Congressional District.
 - (b): indicates Congressional District
 - Map dots indicate Location of Top 3 Contractors in State
 - Star indicates PM
 - ☐ Top 5 (or less) States with Program Contractors
 - ☐ Other States with Program Contractors

As Of: 5 Jun 98

Committed to Excellence

LTV LCM Strategy Pillars



Foundation:
**Stable funding stream & strong Army &
joint requirements**

Recommended LTV LCM Strategy

Features

- Recapitalize Investment:

- ☐ Supports a hybrid remanufacture effort to improve the condition of the fleet within economic threshold



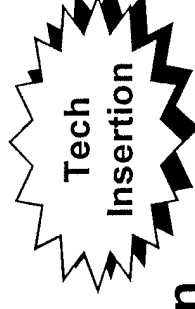
- Maintain Production:

- ☐ Maintains HMMWV production for AAO requirements:

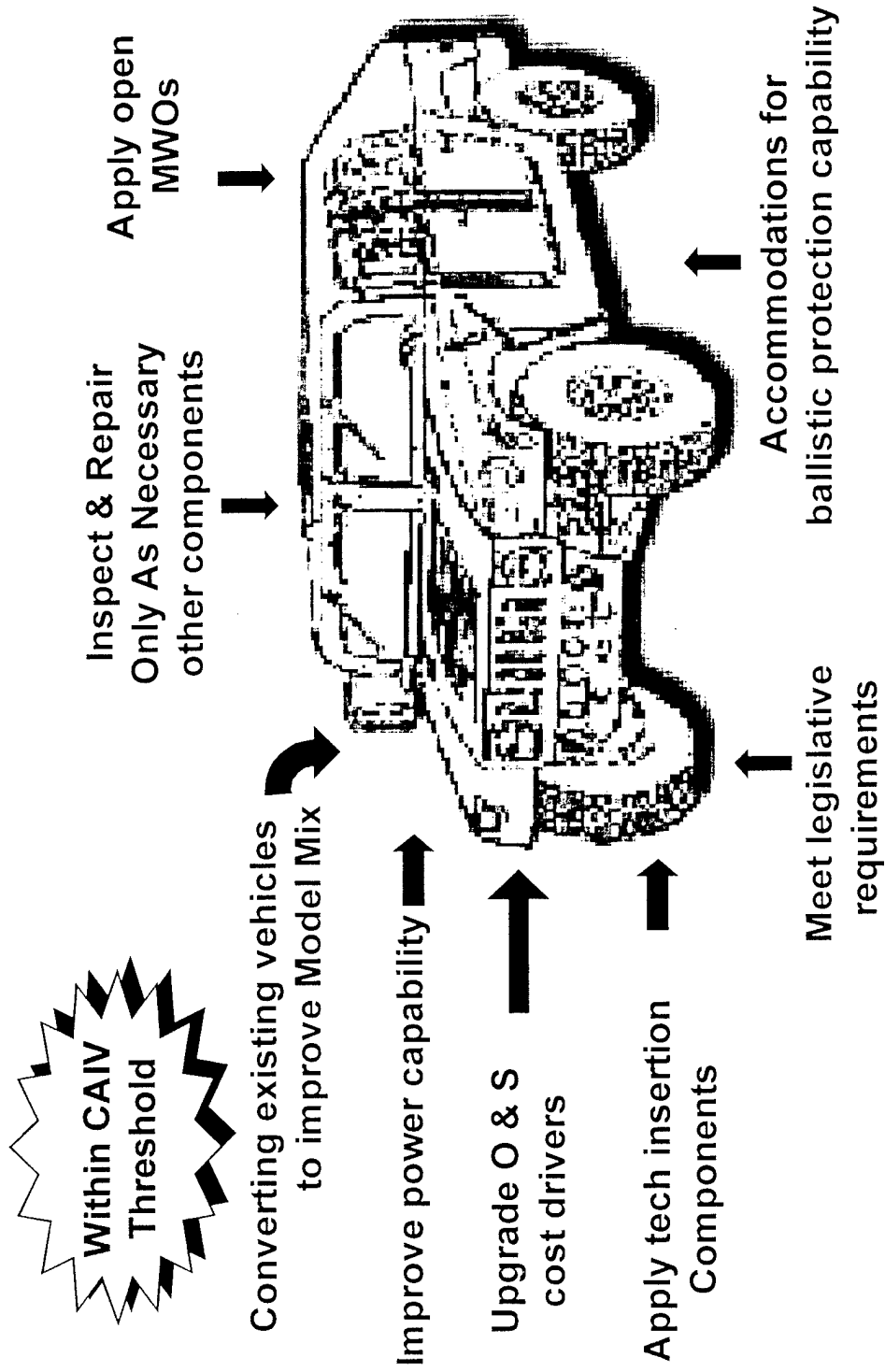


- Modernize Fleet:

- ☐ Leverages Commercially Based Tactical Truck (COMBATT) technology demonstration program

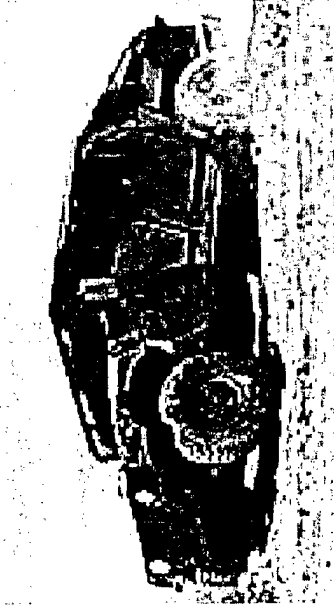


Hybrid Remanufacturing Definition



Maintain Production Pillar

- Objectives
 - Continue HMMWV production to fill critical shortages (XM1113, XM1114, & M1097A2s)
 - Fill critical joint requirements
 - Provide higher reliability to maneuver forces
 - Provide an opportunity for fleet modernization
 - Leverage commercial technologies
 - Integrate Modernization Through Spares initiatives
 - Lower fleet O&S costs
 - Maintain a warm production base



Modernize Fleet Pillar

- Objective
 - └ Produce modernized HMMWVs that meet Army XXI goals
 - Lower cost of ownership
 - Affordable
 - Information dominance capability
 - Leverage and integrate technology
 - Provide high optempo, agility w/o any increase in O&S costs

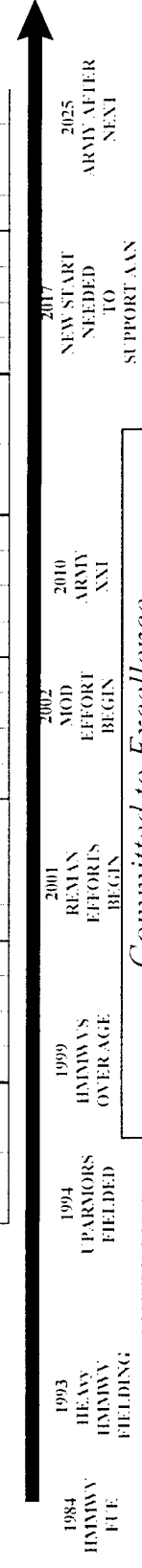
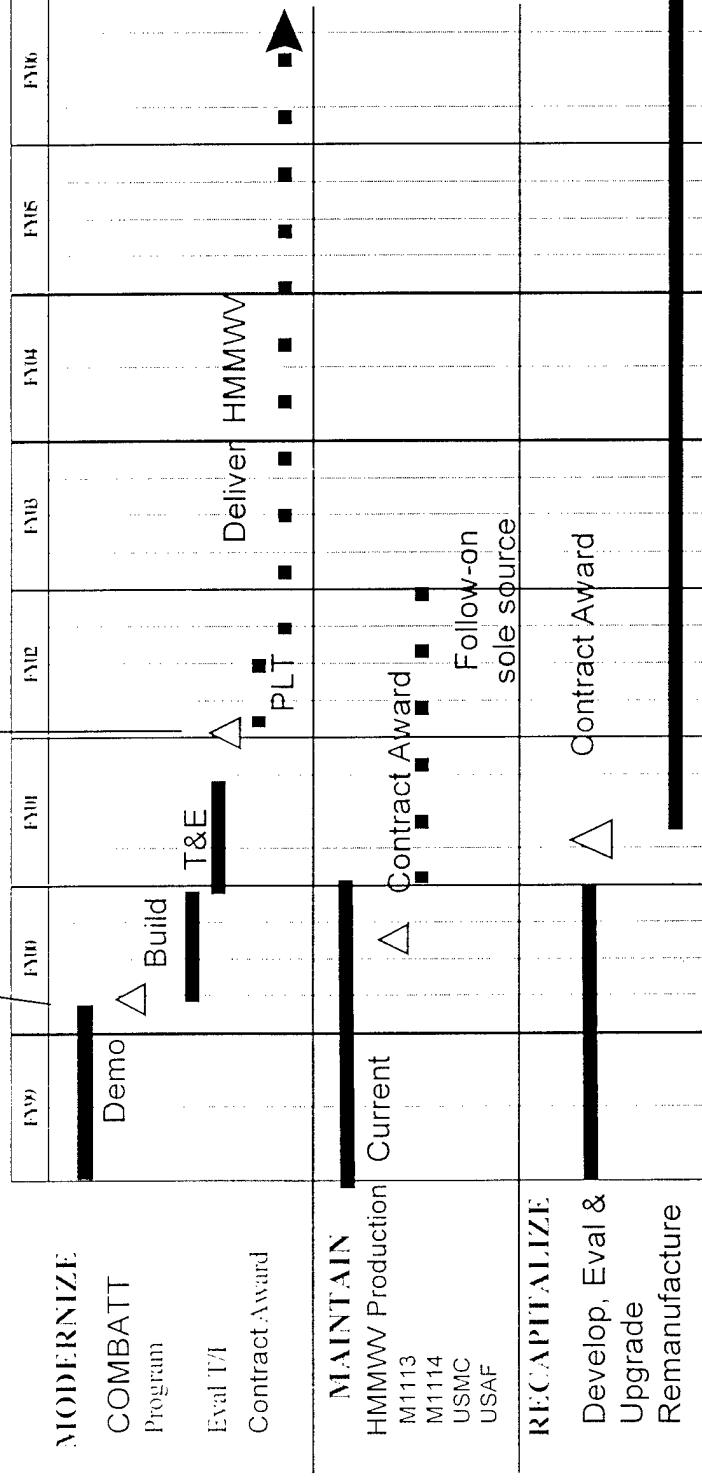


LTV LCM Strategy Schedule

Decision Point:

- HMMWV Tech Insertion (O&S Reduction)
- Down select

Tech inserted HMMWV

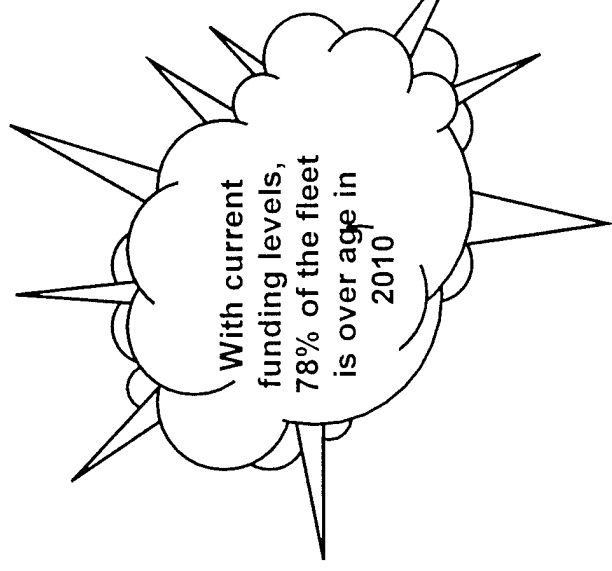


Committed to Excellence

23 Sep 98

Light Tactical Vehicle Life Cycle Management Strategy

- Supports the HMMWV fleet to maximum extent given funding constraints
- Modernizes a portion of the HMMWV fleet through technology insertion in new production and remanufacturing
- Recognizes the value of current HMMWV investment
- Introduces competition in new production and hybrid remanufacturing



Summary

- HMMWVs are needed to support our combat mission objectives
-
- Current funding levels do NOT meet current Force Package 1 and 2 requirements
-
- By 2010, 100% of the vehicles in FP 1 & 2 units will be over 15 years old, costing units \$5800 per vehicle and 20 average down days annually based on 4000 miles per year
-
- Partnering with materiel developer, combat developer, and contractors is a must to meet our goals and objectives

